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Fort Worth District

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**DRAFT**

**ENVIRONMENTAL BASELINE DOCUMENT**  
In support of the

**SUPPLEMENTAL PROGRAMMATIC  
ENVIRONMENTAL IMPACT STATEMENT  
FOR  
INS AND JTF-6 ACTIVITIES  
ALONG THE U.S./MEXICO BORDER**

**VOLUME 1  
TEXAS GULF COAST STUDY AREA**



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LIST OF ACRONYMS AND ABBREVIATIONS

A.D.	=	Anno Domini (in the year of the Lord)
a.m.	=	ante meridiem (before noon)
AIC	=	Agency Information Consultants
AIRFA	=	American Indian Religious Freedom Act
A.O.U.	=	American Ornithologists Union
AMTRAC	=	National Railroad Passenger Corporation
AQCR	=	Air Quality Control Regions
B.C.	=	Before Christ
B.P.	=	Before Present
C1	=	Candidate Category One
CAAA	=	Clean Air Act Amendments
CCMP	=	Comprehensive Conservation and Management Plan
CEQ	=	Council on Environmental Quality
CERCLA	=	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	=	CERCLA Information System
CFR	=	Code of Federal Regulations
CO	=	Carbon Monoxide
CRM	=	Cultural Resource Management
CTC	=	Cradle of Texas Conservancy, Inc.
dB	=	Decibels
dBA	=	Decibels on the A-weighted scale
DDD	=	Dichloro diphenyl dichloroethane
DDE	=	Dichloro diphenyl ethylene
DDT	=	Dichloro diphenyl trichloroethane
DU	=	Ducks Unlimited
E	=	Endangered or Endemic
ed(s).	=	editor(s)
e.g.	=	exempli gratia (for example)
EIS	=	Environmental Impact Statement
ELMR	=	Estuarine Living Marine Resources
ERF	=	Estuarine Research Federation
ESA	=	Endangered Species Act
est.	=	estimate
et al.	=	et alii (and others)
et seq.	=	et sequens (and the following)
etc.	=	et cetera (and others)
F	=	Fahrenheit
Fms.	=	Formations
Ft.	=	Feet
FWR	=	Federal Wildlife Refuge
GAO	=	General Accounting Office
GBNEP	=	Galveston Bay National Estuary Program
GLO	=	General Land Office
hr.	=	hour
HRMN	=	Houston Regional Monitoring Network
I	=	Introduced

LIST OF ACRONYMS AND ABBREVIATIONS  
(cont'd)

IAQCR	=	Intrastate Air Quality Control Region
IBWC	=	International Boundary and Water Commission
i.e.	=	id est (that is)
IN	=	Insufficient
INS	=	Immigration and Naturalization Service
ITP	=	Industrial Toxic Project
JTF-6	=	Joint Task Force Six
L <sub>dn</sub>	=	day-night average noise level
LAPS	=	Land Acquisition Priority System
lbs.	=	pounds
LMV	=	Lower Mississippi Valley
LP/OP	=	Listening Post/Observation Post
LPUST	=	Leaking Petroleum Underground Storage Tank
L.R.G.V.	=	Lower Rio Grande Valley
LUST	=	Leaking Underground Storage Tank
M	=	Mixing zone
MBTA	=	Migratory Bird Treaty Act
Max.	=	Maximum
mg/l	=	milligrams per liter
Min.	=	Minimum
mph	=	miles per hour
mrem	=	millirems
MSA	=	Metropolitan Statistical Area
m.y.	=	million years
NA	=	Non-attainment
N/A	=	Not Applicable
NAAQS	=	National Ambient Air Quality Standards
NAGPRA	=	Native American Graves Protection and Repatriation Act
NAMS	=	National Air Monitoring Stations
NAS	=	Naval Air Station
NASA	=	National Aeronautics and Space Administration
NCPDI	=	National Coastal Pollutant Discharge Inventory
n.d.	=	no date
NEP	=	National Estuary Program
NI	=	Native Introduced
ND	=	No Data
NEPA	=	National Environmental Policy Act
No.	=	Number
NO <sub>x</sub>	=	Nitrous Oxides
NO <sub>2</sub>	=	Nitrogen Dioxide
NOAA	=	National Oceanic and Atmospheric Administration
NOS	=	National Ocean Service

LIST OF ACRONYMS AND ABBREVIATIONS  
(cont'd)

NPL	=	National Priorities List
NPS	=	National Park Service
NRHP	=	National Register of Historic Places
NHS	=	National Historical Site
NWPCP	=	National Wetland Priority Conservation Plan
NWI	=	National Wetland Inventory
NWR	=	National Wildlife Refuge
O <sub>3</sub>	=	Ozone
OTF	=	Ozone Task Force
p	=	pages
part.	=	particulates
Pb	=	Lead
PCB	=	Polychlorinated Biphenyl
pCi/l	=	picocuries per liter
PE	=	Proposed Endangered
P.L.	=	Public Law
PM	=	Particulate Matter
PM <sub>2.5</sub>	=	Particulate Matter of a size of or less than 2.5 microns
PM <sub>10</sub>	=	Particulate Matter less than 10 microns in diameter
ppm	=	parts per million
PSD	=	Prevention of Significant Deterioration
PSI	=	Pollutant Standard Index
PVT	=	Private
RCRA	=	Resource Conservation and Recovery Act
RCRIS	=	Resource Conservation and Recovery Information System
Rep.	=	Report
S	=	Seawater zone
SARA	=	Superfund Amendments and Reauthorization Act
SCS	=	Soil Conservation Service
SEDUE	=	Secretaria de Desarrollo y Ecologia
SETRPC	=	South East Texas Regional Planning Commission
SHP	=	State Historical Park
SHPO	=	State Historic Preservation Officer
SHS	=	State Historical Structure or Site
SIP	=	State Implementation Plan
SLAMS	=	State/Local Air Monitoring Stations
SO <sub>2</sub>	=	Sulfur Dioxide
SO <sub>x</sub>	=	Sulfur Oxides
spp.	=	species
sq.	=	square
SRA	=	State Recreational Area
T	=	Threatened or Tidal Fresh Zone
T/SA	=	Threatened due to similarity of appearance
TAC	=	Texas Antiquities Code

LIST OF ACRONYMS AND ABBREVIATIONS  
(cont'd)

TACB	=	Texas Air Control Board
TACP	=	Tactical Air Control Procedure
TNRCC	=	Texas Natural Resources Conservation Commission
TOXNET	=	Toxicology Data Network
TPWD	=	Texas Parks and Wildlife Department
TRI	=	Toxic Release Inventory
TSP	=	Total Suspended Particulate
TSWQS	=	Texas Surface Water Quality Standards
TWC	=	Texas Workforce Commission
U/A	=	Unclassified/Attainment
UATMP	=	Urban Air Toxics Monitoring Program
μ	=	micron
μg/l	=	micrograms per liter
μg/m <sup>3</sup>	=	micrograms per cubic meter
UIC	=	Underground Injection Control
U.S.	=	United States
U.S.C.	=	U.S. Code
USBR	=	U.S. Bureau of Reclamation
USACE	=	U.S. Army Corps of Engineers
USDA	=	U.S. Department of Agriculture
USEPA	=	U.S. Environmental Protection Agency
USFWS	=	U.S. Fish and Wildlife Service
USGS	=	U.S. Geological Service
USN	=	U.S. Navy
UST	=	Underground Storage Tank
var.	=	variety
VOC	=	Volatile Organic Compound
WMA	=	Wildlife Management Area
yr.	=	year

## **TEXAS GULF COAST**

### **I. INTRODUCTION**

#### **1.0 Purpose**

The Immigration and Naturalization Service (INS) and Joint Task Force Six (JTF-6) have completed a series of five Technical Support Documents to define the baseline environmental conditions along the Texas Gulf Coast and the United States/Mexico International Land Border (Figure 1). Volume One discusses the baseline environmental information on the Texas Gulf Coast from Port Arthur to Brownsville, Texas. Volume Two documents the environmental conditions along the Texas Land Border; Volume Three the New Mexico Land Border; Volume Four the Arizona Land Border; and Volume Five the California Land Border. The information in these Technical Support Documents was used to develop a Supplemental Programmatic Environmental Impact Statement (SPEIS) to assess potential and cumulative environmental impacts on proposed JTF-6 activities in these areas. The SPEIS was developed by the U.S. Army Corp of Engineers (USACE), Fort Worth District, in cooperation with the Immigration and Naturalization Service (INS) as the lead agency. This is the first volume in the series of five Technical Support Documents

#### **2.0 Need**

In 1970, the U.S. Congress passed the National Environmental Policy Act (NEPA) [Public Law (P.L.) 91-190, 42 United States Code (U.S.C.) 4321 et seq.] which requires agencies of the federal government to make information available on the environmental impacts of its proposed actions available to the public. Section 102(2)(C) requires an EIS be prepared for major federal actions which may significantly affect the quality of the human environment. The Council on Environmental Quality (CEQ) issued implementing regulations based on NEPA. (40 CFR1500-508) Executive Orders 11514 and 11991 provide Presidential direction to federal agencies for implementation of NEPA's requirements.

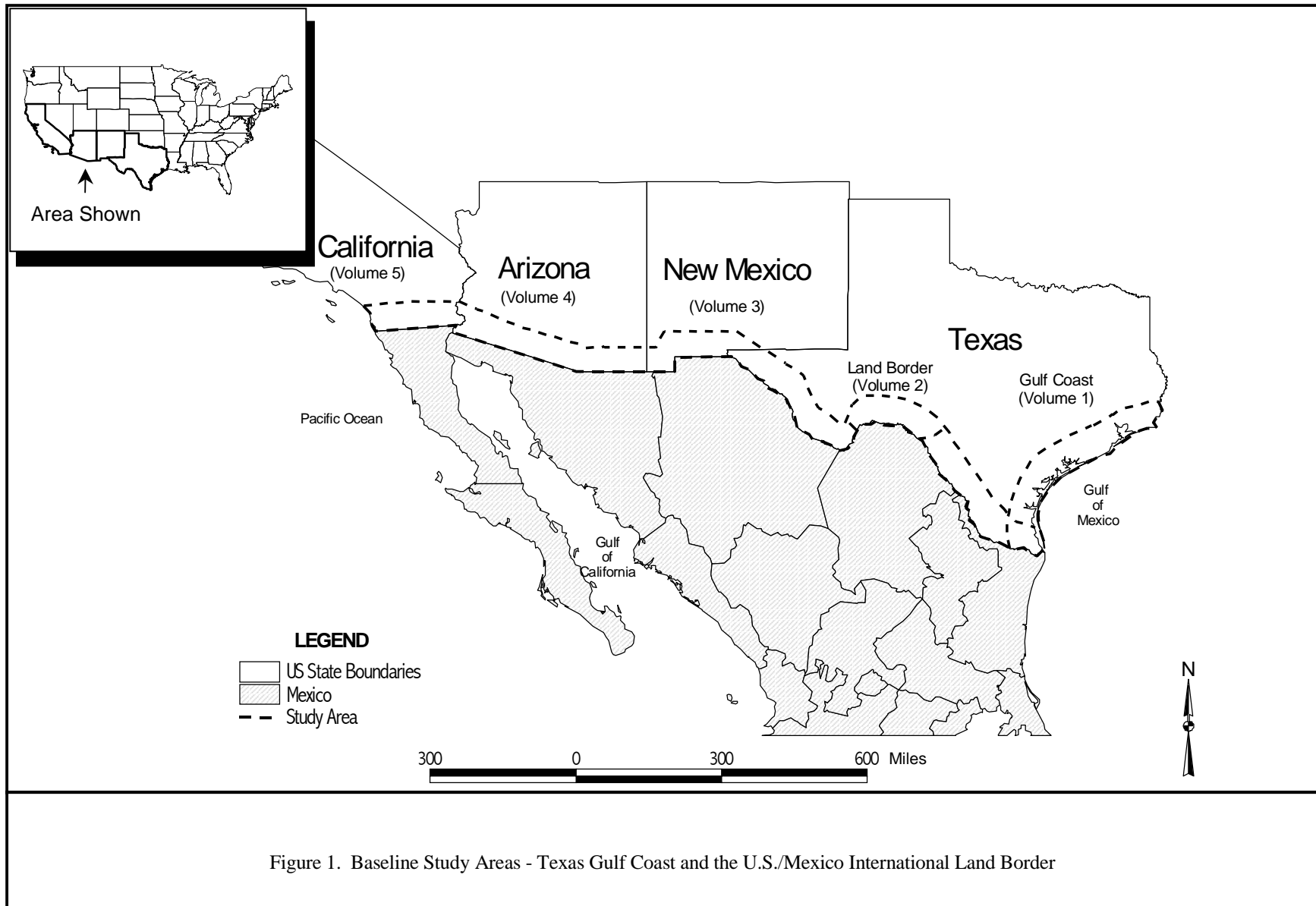
#### **3.0 General Background**

##### **3.1 Purpose and Mission of INS/JTF-6**

The INS has the responsibility to regulate and control immigration into the U.S. In 1924, the U.S. Congress created the United States Border Patrol (USBP) to be the INS enforcement agency. The USBP's primary function is to detect and prevent the unlawful entry and smuggling of aliens along the nation's land and water borders. With the increase in illegal drug trafficking, the USBP also has become the leader for drug interdiction between land ports of entry (POE).

The INS and the USBP use various facilities in its daily operations for the deterrence and detection of illegal trafficking as well as for processing aliens once an apprehension is made. Because of this training of law enforcement officers, intelligence gathering, and transportation of evidentiary material is needed. INS often requests assistance in these activities as well as in the design, construction or upgrade of the facilities they use. Joint Task Force Six (JTF-6) routinely provides such assistance, when requested, to INS, USBP and numerous other drug law enforcement agencies (DLEA).

JTF-6 was activated on November 13, 1989, at Fort Bliss, Texas, by the authority of the Secretary of Defense in accordance with the President's National Drug Control Strategy. JTF-6 provides assistance and support to DLEAs and is under the command of U.S. Atlantic Command (USACOM) in Norfolk, Virginia. This assistance is provided



at sites located throughout the continental U.S. JTF-6 synchronizes and integrates Department of Defense (DoD) operational, engineering, technological, training and intelligence support to DLEA counterdrug efforts to reduce the availability of illegal drugs in the U.S.

### 3.2 INS Activities

INS is mandated by the U.S. Congress to control immigration to the United States, including the detection and deterrence of illegal entries and drug smuggling. Numerous passive and active (proactive and reactive) measures are used to counter these illegal activities. Passive measures include intelligence gathering, remote sensing, and information transfer from other agencies. Active measures include construction of barriers (roads, fences, ditches, vehicle barriers), checkpoints, manned surveillance operations, and, of course, apprehensions. All of these activities require various supporting infrastructure such as detention centers, check point stations, maintenance facilities, remote surveillance system towers, light poles, ports of entry, and improved roads.

Government construction activities are typically contracted to the private sector through the appropriate contracting mechanisms. This is particularly true for major construction activities such as ports of entry. However, INS will often request support from JTF-6, through Operation Alliance, for construction of gravel/dirt patrol roads, fences, vehicle barriers, training courses, ditches, bridges, communications and surveillance system towers, and small check point stations.

### 3.3 Activities of JTF-6

The actions performed by JTF-6 personnel are quite diverse and include three types of support: (1) operational, (2) general, and (3) engineering. Examples of operational support are surveillance and reconnaissance missions, flight exercises, and riverine operations. Specific types of surveillance missions include: Listening Post/Observation Post (LP/OP), ground patrols, helipads, ground sensors, terrain denial, aerial photography, and infrared radar. Currently, most operational support activities performed by JTF-6 require prior approval from the Secretary of Defense. General support primarily deals with training and includes intelligence, mobile training teams, dog-and-handler teams, and communications. Engineering support is also available to various agencies with counterdrug enforcement responsibilities. This work primarily involves construction of new facilities and/or repair of roads, bridges, culverts and gabions, ranges, helipads, LP/OP sites, communication towers, buildings, fences, shooting houses, boat ramps, tunnels, well drilling and septic systems, sheds, and the removal of vegetation.

## 4.0 Study Area

### 4.1 Physiographic Province

Four major physiographic provinces occur within the State of Texas: Gulf Coastal Plains, Interior Lowlands, Great Plains, and Basin and Range. The study area (Texas Gulf Coast) lies within the Gulf Coastal Plains Physiographic Province (Figure 2). The Gulf Coastal Plains are the western extensions of the coastal plain extending from the Atlantic Ocean to beyond the Rio Grande. It is bounded on the northwest by the Balcones Fault and Escarpment, on the north by the East Texas Forests, and on the southwest by the Rio Grande (South Texas) Plains. Its characteristic rolling to hilly woods extends into East Texas, but in the increasingly arid west its forests become secondary in nature, consisting largely of post oaks and, farther west, prairies and brush lands. The tidewater coastline of this province extends 624 miles from the Sabine River, which defines the border with Louisiana, to the mouth of the Rio Grande, which forms the southern border with Mexico (Cummings 1990; USACE 1994; Kingston 1993).

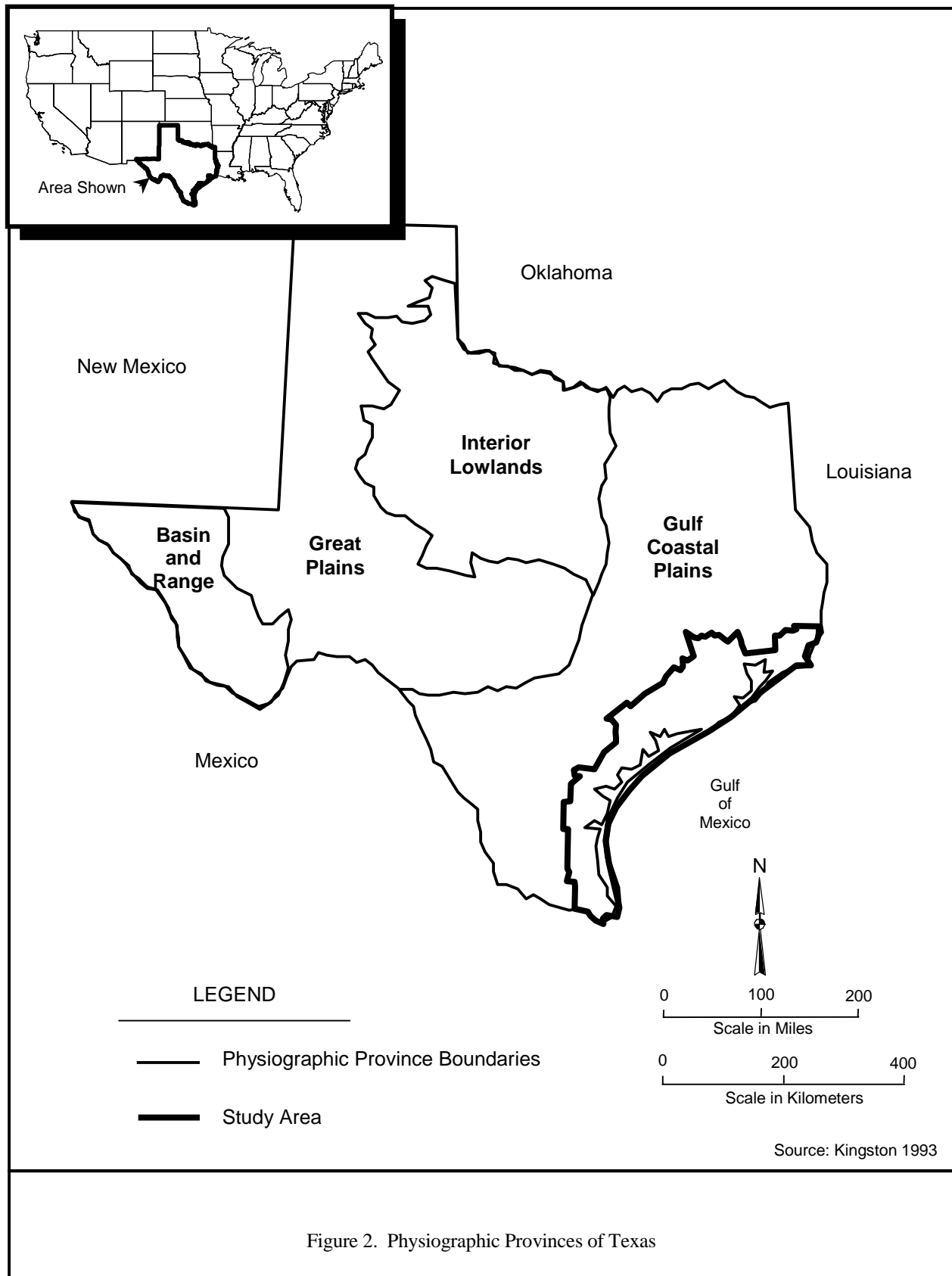
### 4.2 Project Region

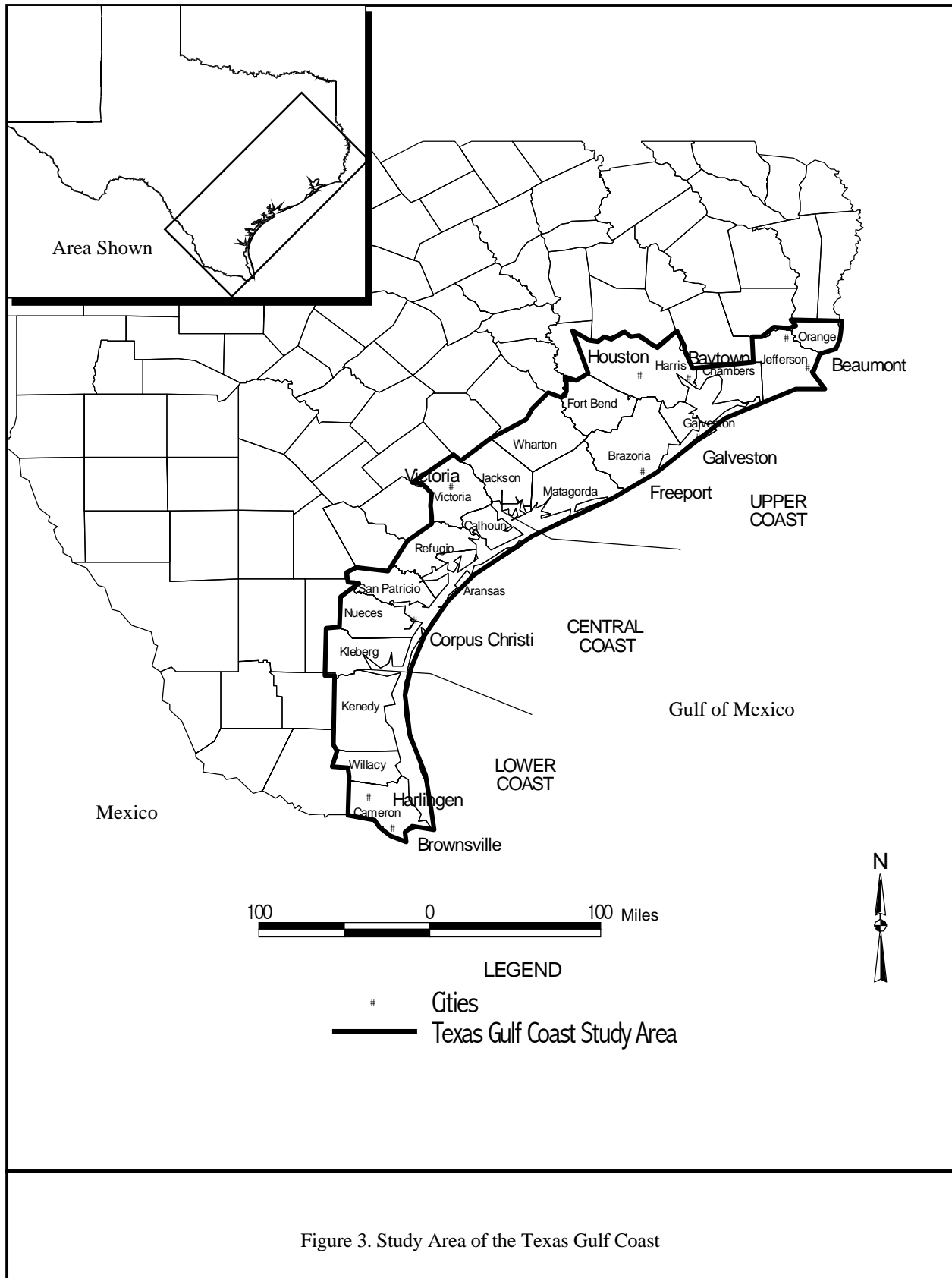
The study area along the Texas Gulf Coast consists of the Upper, Central, and Lower Gulf Coast and includes all counties bordering the coast with the exception of the area between Galveston and Port Lavaca, where the study area includes both the coastal and the adjacent inland counties (Figure 3). The study area also includes the Three Marine League Line which encompasses one to three miles into the Gulf of Mexico from the seaward side of Padre Island and the other off-shore (barrier) islands (i.e., Mustang, Matagorda, Galveston) along the coast.

## 5.0 Report Organization

Baseline conditions within each physiographic province of the study area are addressed in Section II. Environmental components of the physiographic province are presented sequentially under the following general categories: Physical Setting, Natural Environment, Socioeconomic Conditions, and Cultural Resources. The subcategories to be discussed under each general category are listed below.

- 1.0 Physical Setting
  - Location
  - Climate
  - Geological Resources
  - Soils
  - Air Quality
  - Water Quality and Supply
  - Noise
  - Land Use
  - Transportation
  - Hazardous Waste
- 2.0 Natural Environment
  - Biotic Provinces
  - Vegetation Communities
  - Wildlife Communities
  - Threatened/Endangered Species and Critical/Sensitive Habitats
  - Unique and Sensitive Areas-Wetlands
- 3.0 Socioeconomic Conditions
  - Population
  - Housing
  - Employment
  - Income
- 4.0 Cultural Resources
  - Geographic/Environmental Setting
  - Site Locations
  - Type of Sites
  - History of Previous Investigations
  - Prehistoric Overview
  - Historic Overview





## II. GULF COASTAL PLAINS PHYSIOGRAPHIC PROVINCE

### 1.0 Physical Setting

#### 1.1 Location

The study area of Texas Gulf Coast lies within the Gulf Coastal Plains Physiographic Province (see Figures 2 and 3). Ten counties comprise the Upper Coast, which extends from the Sabine River to Port O'Connor in Calhoun County, seven counties comprise the Central Coast (also known as the Texas Coastal Bend) from Port O'Connor to Baffin Bay in Kleberg County, and three counties comprise the Lower Coast from Baffin Bay south to the mouth of the Rio Grande (Table 1) (U.S. Army 1994).

Table 1 - List of Counties in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Upper Coast	Central Coast	Lower Coast
Orange	Victoria	Kenedy
Jefferson	Calhoun	Willacy
Chambers	Refugio	Cameron
Harris	Aransas	
Galveston	San Patricio	
Fort Bend	Nueces	
Brazoria	Kleberg	
Wharton		
Matagorda		
Jackson		

Source: Shearer Publishing 1988

#### 1.2 Climate

The Texas Gulf Coast encompasses three climatic divisions: Upper Coast, South Central, and Lower Valley. The Upper Coast Climatic Division is usually classified as humid subtropical with warm summers. This division is considered distinct with a small annual temperature range and a seasonal pattern of rainfall (average 48 inches) with the maximum amounts of precipitation occurring in summer and winter. Both these characteristics are attributable to its proximity to the warm waters of the Gulf of Mexico. Winds average 10 miles per hour and are generally from the south except during winter when northerly winds prevail. Therefore, the Upper Coast Division is essentially monsoonal. Relative humidity is high along the coastal belt. Humidity levels show little seasonal variation, ranging from 95 percent in the morning to 60 percent in the afternoon. Climatological data for counties in the Upper Coast Climatic Division are listed in Table 2.

The South Central Climatic Division is generally designated as humid subtropical with hot summers. It has a rather uniform seasonal pattern of rainfall (average 32 inches) with slight maximums occurring in May and September. The temperature range is not great because of the proximity of the coast and the maritime air masses that often cover the area. Temperatures can reach 100°F during the summer, while very cold temperatures, below 10°F, are extremely rare. The prevailing wind is south to southeasterly and averages 12 miles per hour during the spring, summer, and fall, indicating the climate is determined largely by the Gulf of Mexico. However, some strong northerly flow can affect the region in the winter. The relative humidity during the course of a day ranges from 90 percent in the morning to 63 percent in the afternoon due to the maritime air influence. Climatological data for counties in the South Central Climatic Division are listed in Table 2.

Table 2 - Climatological Data for Counties in the Climatic Divisions of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Climatic Division/ Counties	Mean Annual				Prevailing Wind Direction
	Temperature (°F)		Precipitation (inches)	Relative Humidity (percent)	
	Max.	Min.			
UPPER COAST					
Orange	91	40	59.2	76	S/N
Jefferson	93	42	52.8	76	S/N
Chambers	91	41	51.6	77	S-SE
Harris	93	46	42.6	72	S to S-SE/N-NW
Galveston	87	48	40.2	74	SE
Fort Bend	94	41	43.9	74	S-SE/N-NW
Brazoria	92	42	52.3	77	SE
Wharton	93	44	41.3	71	S
Matagorda	91	46	43.2	71	SE/N
Jackson	94	42	40.9	71	S
Calhoun	93	44	42.2	77	SE to S-SE
SOUTH CENTRAL					
Victoria	94	43	36.9	71	SE to S-SE
Refugio	94	43	38.8	71	SE
Aransas	92	45	36.9	71	SE
San Patricio	94	44	34.4	74	SE to S-SE
Nueces	94	46	30.2	74	SE to S-SE
Kleberg	95	46	27.5	74	SE to S-SE
Kenedy	95	45	29.7	74	SE/S-SE
LOWER VALLEY					
Willacy	96	47	27.5	72	SE/N-NW
Cameron	93	51	25.4	72	SE to S-SE/N-NW

Legend: Max. = Maximum, Min. = Minimum, F = Fahrenheit

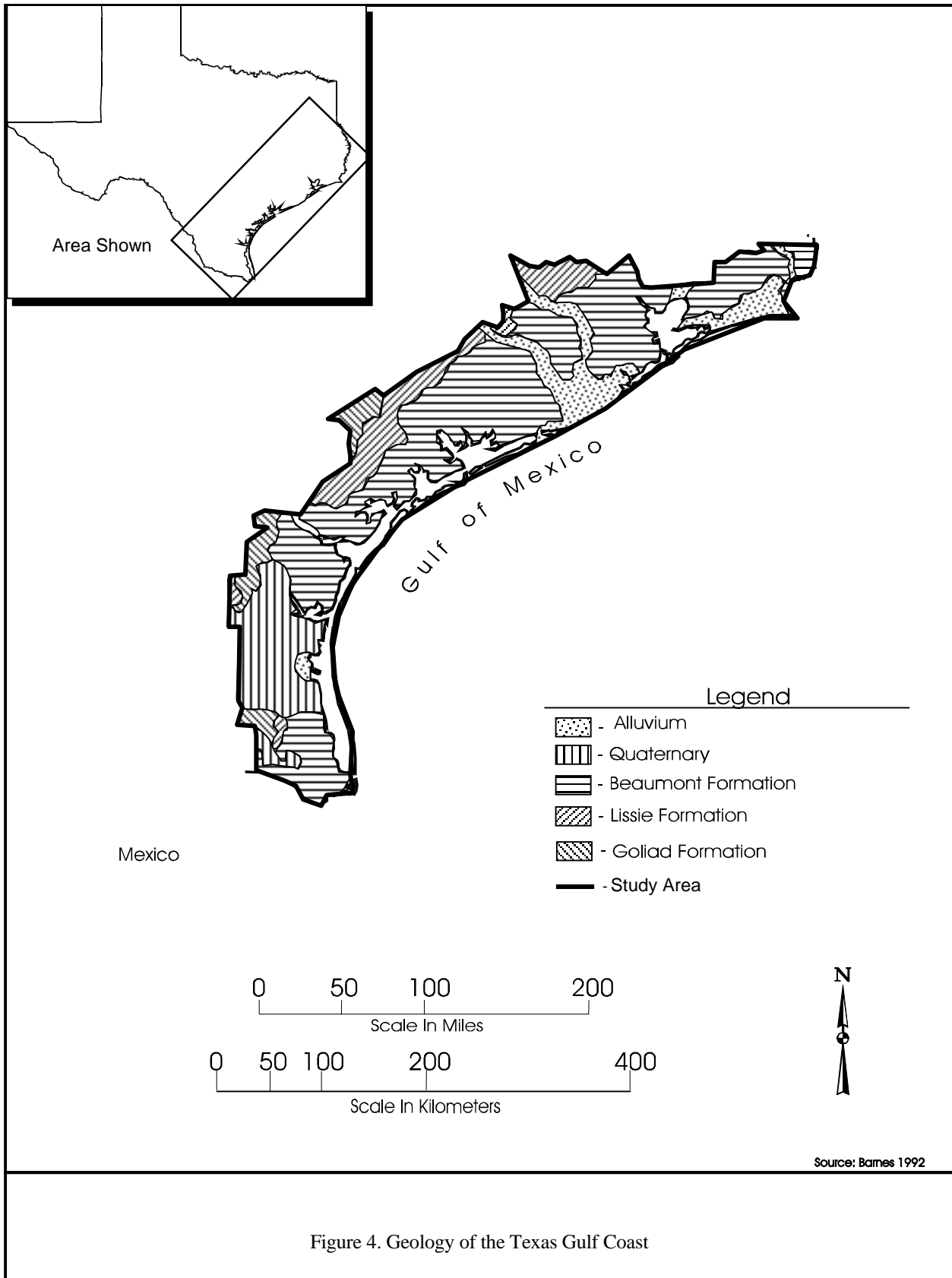
Source: National Fibers Information Center 1987; Kingston 1993

The Lower Valley Climatic Division is classified as semi-arid subtropical with warm or hot summers. Precipitation varies from about 19 to 27 inches annually, while temperatures show considerable uniformity throughout the area. Record highs reach around 105 °F, with extreme lows into the teens. Prevailing winds average 11.6 miles per hour and are southeasterly throughout the year. Relative humidity is high, ranging during the course of a day from 88 percent in the morning to 60 percent in the afternoon. Climatological data for counties in the Lower Valley Climatic Division are listed in Table 2 (National Fibers Information Center 1987; Kingston 1993).

### 1.3 Geological Resources

#### 1.3.1 Introduction and Physiography

Past geologic events in Texas have formed wide outcrop bands which generally lie parallel to the present Gulf of Mexico shoreline (Renfro et al. 1973) (Figure 4). The band along the Texas Gulf Coast which extends approximately 60-100 miles in from the present shoreline is known as the Upper and Lower Gulf Coastal Plains. It is generally bounded on the west by the Oakville Escarpment, which is a surface expression of harder bedrock (the Miocene-aged Oakville Sandstone).



The Gulf Coastal Plains Province has few notable topographic features or distinctive natural landforms (Ferguson 1986). In general, landforms in the area are rather subtle and reflect different rock types with the sandstones forming gentle hills and the shales forming valleys. The rivers are mature and their valleys broad and gently sloping. In some places the base of the Quaternary is marked by a definite, but gentle, ridge of sand and gravel cemented by calcareous caliche. Small rounded hills are remnant sand dunes from previous shorelines, now superseded by progressively younger shorelines to the east.

From Matagorda south to Port Isabel, the coast is bordered by an almost continuous series of narrow barrier islands formed from river-deposited sediment which has been sorted and shaped by ocean currents and winds. These islands are stabilized by vegetation which protects them from erosion and transportation (Ferguson 1986).

### 1.3.2 Surface Stratigraphy

Almost the entire surface geology of the Upper and Lower Gulf Coastal Plains is characterized by broad sub-parallel bands of Quaternary sedimentary rocks and unconsolidated deposits. These include deposits of Pleistocene Age (about three million years old) and Holocene Age (about 10,000 years old). These sediments were deposited and rock formations created as the shoreline progressively receded east to the present boundaries of the modern Gulf of Mexico.

Relatively young rocks are exposed at the surface along the coast with progressively older rock formations exposed to the west. Formations along the Gulf Coastal Plains include the Montgomery, the Bentley, and the Beaumont, with the Deweyville also present in the Upper Gulf Coastal Plain (Table 3) (Renfro et al. 1973).

Table 3 - Stratigraphic Chart for the Gulf Coastal Plains Province  
(Texas Gulf Coast)

System	Series	Age (B.P.)	Formation	Description
Quaternary	Holocene	10,000 yr. to present	Sand Sheet and Alluvium	Unconsolidated, mixed sand, silt, and clay with some gravel
	Pleistocene	3 m.y. to 10,000 yr.	Deweyville (Upper only)	Terrace deposits
		3 m.y. to 10,000 yr.	Beaumont Clay (Upper and Lower)*	Pooly bedded, variegated calcareous clay with minor silt and fine sand beds
		3 m.y. to 10,000 yr.	Montgomery (Upper and Lower)	Sand, silt, gravel and clay
		3 m.y. to 10,000 yr.	Bentley (Upper and Lower)	Sand, gravel, silt and clay

\* Upper and Lower refer to area(s) within the Texas Gulf Coast area

Legend:    B.P.    =    Before Present  
              m.y.    =    million years  
              yr.     =    year

Source: Renfro et al. 1973; Barnes 1992

The predominant consolidated rock types are mixed shales and sandstones derived from alluvial deposition by the prehistoric Rio Grande and other rivers. Closer to the coastal (eastern) edge of the province, the surface deposits are unconsolidated sediments including sand dunes formed by wind and water from beach or river sand and in places stabilized by vegetation. The sand dunes mark more recent shorelines when the coast was located farther inland than it is now (Renfro et al. 1973; Sheldon 1979).

The rocks on the Upper and Lower Gulf Coastal Plains are all sedimentary clastics in origin. Their components were derived from existing rocks of different types and transported, deposited, and reworked by water processes. Igneous

rocks are not present in this province, and as a result, the rocks that are present have not been subject to metamorphic alteration by heat and/or pressure.

### 1.3.3 Tectonic Features

Structural and tectonic features also parallel the modern coast line. Although the level of tectonic activity increases west of the study area, there are portions of several major fault zones within the Gulf Coastal Plains. These include: the northern portions of the Sam Fordyce-Vanderbilt Fault Zone from Harris County south to Nueces County; the McAllen Fault Zone from Nueces County south to Kleberg County; and the Willamar Fault Zone across Kenedy, Willacy, and Cameron counties. These fault zones do not have surface expression within the Gulf Coastal Plains. Quiescent slip faulting dominates along the coast.

The tectonic setting of the Gulf Coastal Plains is characterized by simple gravity subsidence caused by the increase in thickness (and therefore weight) of beds toward the coast. This episodic progradation and faulting occurred throughout the Cenozoic frequently with modification and overprinting by salt dome growth and movement. Down-to-the-coast faults are both a cause and effect of bed size. The increasing weight of the nearshore accumulation pulls the sediments down creating more space next to the fault to be filled in. It is a self-perpetuating process which keeps faults active over major time periods. In recent times the process has been enhanced by fluid withdrawal in and near oil and gas production areas, until measured withdrawal was recognized as the key to control (Sheldon 1979; Ewing 1991).

### 1.3.4 Mineral Resources

Much of the Upper and Lower Gulf Coastal Plain has a long history of oil and gas development activities. Fields which produce from the Upper Tertiary and Lower Quaternary (Oligocene, Miocene, Pliocene, and Pleistocene) are found in every county in the study area. One of the Gulf Coast geopressed systems, an area identified as a potential source of geothermal power, crosses parts of Harris, Jefferson, and Orange counties (St. Clair et al. 1981). Other energy minerals include coal (lignite) and uranium. Lignite is not mined within the study area counties; however, uranium production through solution mining has occurred in western Kleberg County (U.S. Department of Energy 1981; TWC 1989). Solution mining is deemed preferable to conventional surface or underground mining because there is less disturbance of both land surface and the sub-surface environment although the introduction of a leaching solution can elevate total dissolved solids (TDS) and uranium levels. State law requires restoration to pre-mining conditions, and the relative youth of the solution mining technology coupled with modern more stringent regulations results in a lower occurrence of abandoned, unremediated sites.

## 1.4 Soils

### 1.4.1 General Soil Associations

The Upper and Central Texas Gulf Coast consist mainly of level soils of the Coast Prairie and Marsh, while the Lower Texas Gulf Coast consists of nearly level to undulating soils of the Rio Grande Plain. Acid light-colored soils of the East Texas Timberlands and nearly level to undulating light-colored medium to slightly acid soils of the Claypan area and the Cross Timbers are found in the peripheral regions of the study area (Godfrey et al. 1973). Soil associations in the study area are briefly described below. The permeability range, flooding/erosion hazard, and limitations to construction for each soil association along the Texas Gulf Coast are presented in Table 4.

The Harris-Veston-Galveston soil association, consisting of saline clayey and loamy soils of marshes and sandy soils of beaches, occurs in coastal areas from Port Arthur to Baffin Bay and on the barrier islands. Somewhat poorly and moderately well-drained cracking clayey soils as well as mostly poorly drained soils with loamy surface layers and cracking clayey subsoils (Beaumont-Morey-Crowley, Lake Charles-Edna-Bernard, and Victoria-Orelia-Clareville) occur in the interior portion of the study area from Orange County to Baffin Bay. The major drainage areas consist of grayish cracking soils (Kaufman-Trinity-Tuscumbia) of the Trinity River floodplain and cracking clayey and friable loamy soils (Miller-Norwood-Pledger and Moreland-Pledger-Norwood) of the Brazos and Colorado River floodplains. Nearly level, moderately well to poorly drained loamy soils with yellow and red mottled or gray subsoils (Segno-Splendora-Sorter) form the border areas of Orange County and part of Harris County. The Katy-Hockley-Clodine soil

association, soils with loamy surface layers and mottled clayey or mottled to gray loamy subsoils, are present in the perimeter area from Harris to Refugio Counties. A small portion of the Lufkin-Axtell-Tabor soil association is found in northwestern Victoria County, while the Orelia-Goliad-Clareville soil association, consisting of poorly drained, loamy soils and well-drained dark soils with loamy surface layers and clayey subsoils, form a small part of Nueces County and large portion of Kleberg County including Baffin Bay (Godfrey et al. 1973).

Poorly drained, saline cracking clayey and loamy soils and deep sandy soils (Lomalta-Galveston-Sejita) of the Rio Grande Plain are present in the coastal area from Baffin Bay to Brownsville and on Padre Island. The interior area consists of soils with sandy surface layers and loamy to clayey subsoils and soils sandy throughout (Sarita-Falfurrias-Nueces) in Kenedy County and loamy soils throughout (Hidalgo-Willacy-Delfina) in Willacy County and a portion of Cameron County. Loamy soils and cracking clayey soils of the Rio Grande floodplain and terraces (Harlingen-Laredo-Lagorlia and Rio Grande-Camargo-Matamoros) comprise the remainder of Cameron County including the Rio Grande (Godfrey et al. 1973).

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Table 4 - Soil Characteristics for Counties in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Soil Association	Counties		Permeability Range	Flood/Erosion Hazard	Limitations to Construction
Harris-Veston-Galveston	Orange Jefferson Chambers Galveston Brazoria Matagorda	Calhoun Aransas San Patricio Refugio Kleberg Nueces	Slow-rapid	Occasional-frequent/ Slight-moderate	Low-high shrink swell
Beaumont-Morey-Crowley	Orange Jefferson Chambers		Slow-moderate	Rare/Slight-moderate	Low-high shrink swell
Kaufman-Trinity-Tuscumbia	Chambers		Very slow-slow	Frequent-common/ Slight-moderate	High-very high shrink swell
Lake Charles-Edna-Bernard	Chambers Galveston Harris Brazoria Fort Bend	Wharton Jackson Calhoun Victoria	Slow-moderate	Rare/Slight-moderate	Low-high shrink swell
Victoria-Orelia-Clareville	Refugio San Patricio Nueces Kleberg		Very slow- moderate	None/Slight	Low-very high shrink swell
Miller-Norwood-Pledger	Brazoria Fort Bend Wharton		Very slow-slow	Rare/Slight-moderate	Low-high shrink swell

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Table 4- Soil Characteristics for Counties in the Gulf Coastal Plains Province(Continued)  
(Texas Gulf Coast)

Soil Association	Counties	Permeability Range	Flood/Erosion Hazard	Limitations to Construction
Moreland-Pledger-Norwood	Brazoria Matagorda	Slow	Rare/Slight-moderate	Low-high shrink swell
Segno-Splendora-Sorter	Orange Harris	Slow-moderate	None/Slight-moderate	Low-high shrink swell
Katy-Hockley-Clodine	Harris Fort Bend Wharton Jackson Victoria Refugio	Moderate - moderately rapid	None/Slight-moderate	Low shrink swell
Lufkin-Axtell-Tabor	Victoria	Moderate	None/Moderate	Low shrink swell
Orelia-Golind-Clareville	Refugio San Patricio Nueces Kleberg Kenedy	Slow-moderate	None/Slight	Low-moderate shrink swell
Lomalta-Galveston-Sejita	Kenedy Willacy Cameron	Very slow-rapid	None-frequent/ Slight-moderate	Low-very high shrink swell
Sarita-Falfurrias-Nueces	Kenedy Willacy	Moderately rapid- Rapid	None/Slight	Very low-low shrink swell
Table 4- Soil Characteristics for Counties in the Gulf Coastal Plains Province(Continued) (Texas Gulf Coast)				
Soil Association	Counties	Permeability Range	Flood/Erosion Hazard	Limitations to Construction

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Hidalgo-Willacy-Defina	Willacy Cameron	Moderate - Moderately rapid	None/Slight	Low shrink swell
Harlingen-Laredo-Lagloria	Cameron	Very slow - moderate	None/Slight - moderate	Low-very high shrink swell
Rio Grande-Camargo-Matamoros	Cameron	Slow - rapid	Rare-occasional/ Moderate	Low-very high shrink swell

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Source: Godfrey et al. 1973; Wheeler 1976; Guckian and Garcia 1979; Crenwelge et al. 1981,1988; Jacobs 1981;  
Miller 1982; Turner 1982; Guckian 1988

## 1.5 Air Quality

### 1.5.1 Federal, State, Rural, and Wilderness Standards

The State of Texas has adopted the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) and subsequent changes to these standards as the State's air quality criteria (Table 5). Primary standards are established to protect public health while secondary standards provide protection for the public's welfare, and include wildlife, climate, recreation, transportation, and economic values. Regulations under the Clean Air Act Prevention of Significant Deterioration (PSD) provisions (40 CFR Part 52 - PSD of Air Quality) were enacted in order to maintain or improve the existing air quality in all Intrastate Air Quality Control Regions (IAQCRs) and National Rural and Wilderness Areas. Two of four areas in non-attainment of NAAQS (mainly ozone) are located in the Texas Gulf Coast: the Metropolitan Houston-Galveston Intrastate AQCR and the Southern Louisiana-Southeast Texas Interstate AQCR.

Table 5 - Texas and the National Ambient Air Quality Standards (NAAQS)

<u>Pollutant</u>	<u>National/State Standards</u>	
	<u>Primary<sup>a</sup></u> <u>ppm(<math>\mu\text{g}/\text{m}^3</math>)</u>	<u>Secondary<sup>a</sup></u> <u>ppm(<math>\mu\text{g}/\text{m}^3</math>)</u>
Lead (Pb)		
Quarterly Average	(1.5)	(1.5)
Particulates < 10 micrometers ( $\text{PM}_{10}$ )		
Annual Arithmetic Mean <sup>b</sup>	(50)	(50)
24-Hour Average <sup>b</sup>	(150)	(150)
Particulates < 2.5 micrometers ( $\text{PM}_{2.5}$ )		
Annual Arithmetic Mean <sup>b</sup>	(15)	(15)
24-Hour Average <sup>b</sup>	(65)	(65)
Sulfur Dioxide ( $\text{SO}_2$ )		
Annual Arithmetic Average	0.03(80)	No Standard
24-Hour Average <sup>c</sup>	0.14(365)	No Standard
3-Hour Average <sup>c</sup>	No Standard	0.50 (1300)
Carbon Monoxide (CO)		
8-Hour Average	9(10 $\text{mg}/\text{m}^3$ )	No Standard
1-Hour Average	35(40 $\text{mg}/\text{m}^3$ )	No Standard
Ozone ( $\text{O}_3$ )		
8-Hour Average	0.08(157)	0.08(157)
1-Hour Average <sup>d</sup>	0.12(235)	0.12(235)
Nitrogen Dioxide ( $\text{NO}_2$ )		
Annual Arithmetic Mean	0.053(100)	0.053(100)

Legend: ppm = parts per million (applicable to substances with specific chemical composition)

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter

$\text{mg}/\text{m}^3$  = milligrams per cubic meter

<sup>a</sup> Parenthetical value is an approximately equivalent concentration.

<sup>b</sup> Particulate standards use  $\text{PM}_{10}$  (particles less than  $10\mu$  in diameter) as the indicator pollutant. The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to  $50 \mu\text{g}/\text{m}^3$ ; the 24-hour standard is attained when the expected number of days per calendar year above  $150 \mu\text{g}/\text{m}^3$  is equal to or less than one; as determined according to Appendix K of the Particulate Matter NAAQS.

<sup>c</sup> Not to be exceeded more than once per year.

<sup>d</sup> The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the 0.12 ppm is equal to or less than one as determined according to Appendix H of the Ozone NAAQS.

Source: 40 CFR Part 50 (July 1997); TNRCC 1998

### 1.5.2 Air Quality Control Regions

The 20 counties of the Gulf Coastal Plains Province along the Texas Gulf Coast segment of the study area fall into four Air Quality Control Regions (AQCR) established by the USEPA for air quality planning purposes (40 CFR Part 81). The counties within their respective Texas Natural Resource Conservation Commission Regions are shown in Figure 5 and the corresponding AQCR's listed in Table 6.

#### 1.5.3 Potential Sources of Air Pollutants

The counties of the Texas Gulf Coast segment of the study area can generally be characterized as moderately to heavily populated and highly industrialized. Anthropogenic (man-made) sources of air contaminants in this area include industrial emissions, mobile (vehicular) emissions, and area source emissions (e.g., emissions from numerous residences and small commercial establishments in an urban setting). Meteorological conditions increase air quality problems in some of the more inland portions of the study area by creating numerous periods of atmospheric stagnation and subsequent increases in the concentrations of air pollutants. The highly urbanized and industrialized Houston (Harris County) area experiences numerous episodes of air pollution each year, with most occurring in the warmer months.

Pollutant emissions estimates for stationary industrial sources operating within the 20 counties in the Gulf Coast study area are substantial (Table 7). However, these numbers represent only a portion of the total pollutant emissions. Air pollutant emissions from automobiles and urban activities are also substantial in these counties (TNRCC 1998). Improvements in air quality of the region include no reportable lead in airborne particulate emissions estimates.

Annual emissions of toxic air contaminants are also substantial for the Texas Gulf Coast area (Table 8) (USEPA 1998). This reflects the effects of heavy industry (largely petrochemical) concentrated in areas around Port Arthur, Houston-Galveston, and Corpus Christi (Figure 6). These toxic emissions represent only the emissions reported for selected industries under Section 313 of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and do not include toxic contaminants emitted from automobiles or area sources (small urban sources). A study conducted in the Houston area (Klausmeier 1989) suggested that mobile (vehicular) sources of certain air toxics were far in excess of the respective chemical releases from the industrial sources.

#### 1.5.4 Ambient Air Quality Monitoring/Status

A substantial amount of ambient air quality monitoring has been conducted because of the non-attainment status of some of the Texas Gulf Coast counties and the concern about air toxics in the urban/industrial settings in some of the counties in the study area. In addition to a network of USEPA National Air Monitoring Stations (NAMS), State/Local Air Monitoring Stations (SLAMS), and Urban Air Toxics Monitoring Program (UATMP) sites, there are also some extensive private and public/private partnership monitoring networks. The monitoring activities focus primarily on the ozone and air toxics problems of the Gulf Coast counties in southeast Texas. A number of the monitoring networks (e.g., Houston Regional Monitoring Network (HRMN), the South East Texas Regional Planning Commission (SETRPC) Ambient Air Quality Monitoring Program, Lake Charles Ozone Task Force (OTF), Victoria and Texas City air monitoring programs) formed an organization, The Gulf Coast Regional Air Quality Network, to meet periodically and share experiences and information. An extensive amount of air quality data for both criteria air pollutants and air toxics (primarily VOCs) has been collected for the Texas Gulf Coast through the combined efforts of these monitoring networks.

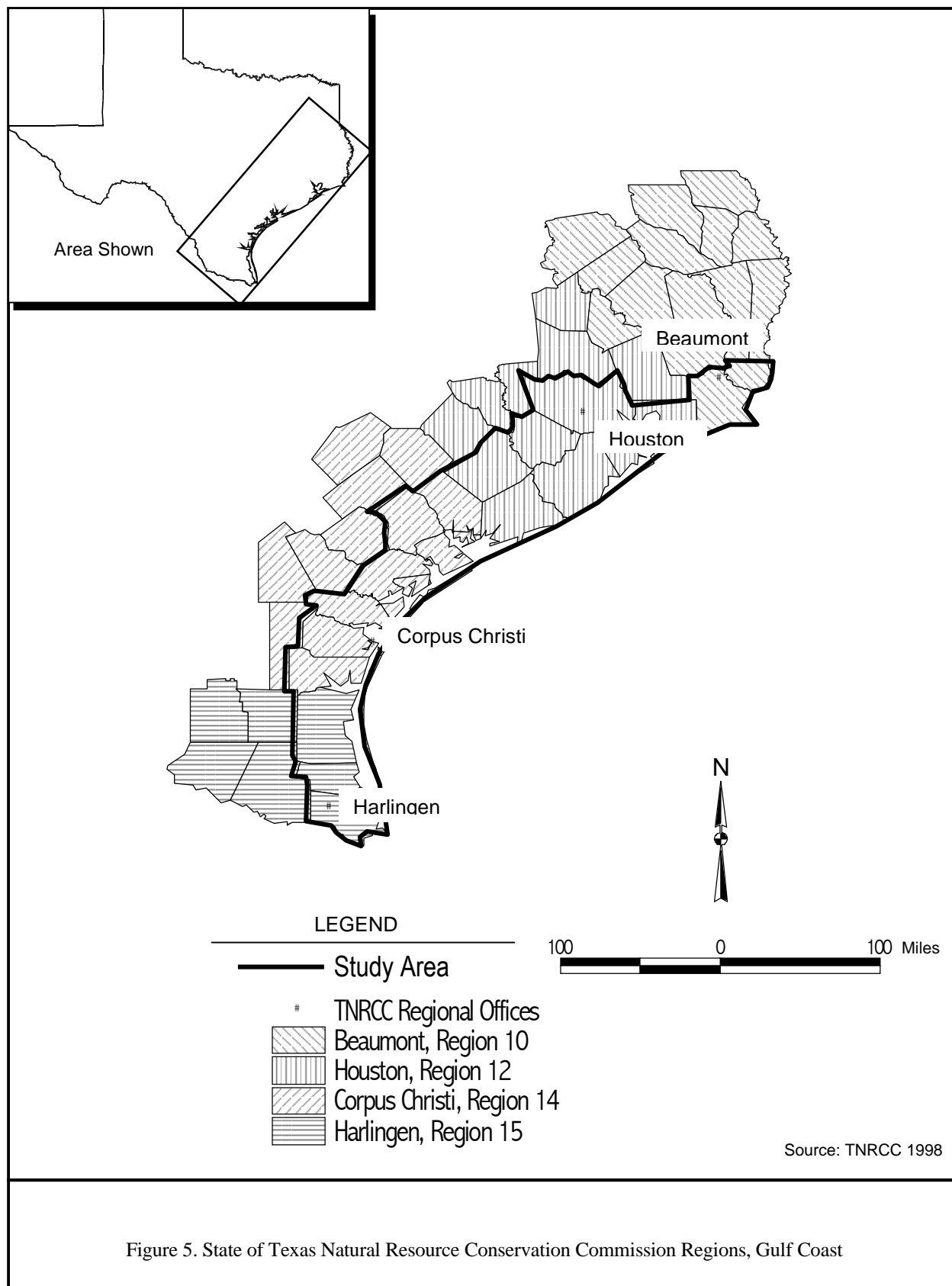


Figure 5. State of Texas Natural Resource Conservation Commission Regions, Gulf Coast

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Table 6 - County Assignments to Federal and State Air Quality Control Regions in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	USEPA Air Quality Control Region	TNRCC Region
Orange	Southern Louisiana-Southeast Texas	10
Jefferson	Southern Louisiana-Southeast Texas	10
Chambers	Metropolitan Houston-Galveston	12
Harris	Metropolitan Houston-Galveston	12
Galveston	Metropolitan Houston-Galveston	12
Fort Bend	Metropolitan Houston-Galveston	12
Brazoria	Metropolitan Houston-Galveston	12
Wharton	Metropolitan Houston-Galveston	12
Matagorda	Metropolitan Houston-Galveston	12
Jackson	Corpus Christi-Victoria	14
Victoria	Corpus Christi-Victoria	14
Calhoun	Corpus Christi-Victoria	14
Aransas	Corpus Christi-Victoria	14
Refugio	Corpus Christi-Victoria	14
San Patricio	Corpus Christi-Victoria	14
Nueces	Corpus Christi-Victoria	14
Kleberg	Corpus Christi-Victoria	14
Kenedy	Corpus Christi-Victoria	15
Willacy	Brownsville-Laredo	15
Cameron	Brownsville-Laredo	15

Legend: USEPA= U.S. Environmental Protection Agency; TNRCC= Texas Natural Resource Conservation Commission; AQCR= Air Quality Control Region Source: 40 CFR Part 81(July 1997); TNRCC 1998

Table 7 - County Emissions Summary for Selected Air Pollutants in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Primary Pollutant Emissions (tons/year)				
	SO <sub>2</sub>	TSP	NO <sub>2</sub>	CO	VOC
Aransas	NR	NR	NR	10,782	1,095
Brazoria	9,642	NR	37,051	3,745	7,861
Calhoun	469	15,259	10,938	NR	5,758
Cameron	NR	NR	1,873	NR	NR
Chambers	283	NR	13,630	8,548	2,177
Fort Bend	67,858	NR	40,078	3,664	512
Galveston	10,127	NR	29,299	11,961	16,200
Harris	43,144	919	96,435	27,626	55,291
Jackson	NR	NR	3,419	NR	278
Jefferson	32,153	388	36,903	11,552	36,595
Kenedy	NR	NR	NR	NR	NR
Kleberg	NR	NR	5,691	NR	402
Matagorda	142	NR	4,159	NR	4,261
Nueces	7,745	3,918	22,954	2,522	12,833
Orange	3,726	NR	77,132	7,606	8,760
Refugio	NR	NR	4,362	NR	621
San Patricio	552	683	3,193	NR	926
Victoria	101	638	6,710	7,808	3,994
Wharton	276	NR	3,207	NR	NR
Willacy	NR	NR	NR	NR	NR
Total:	176,218	21,805	397,034	95,814	157,564

Legend: SO<sub>2</sub> = Sulfur Dioxide; CO = Carbon Monoxide; TSP = Total Suspended Particulates; VOC = Volatile Organic Compound; NO<sub>2</sub> = Nitrogen Dioxide; NR = None Reported  
Source: USEPA - AIRSWeb Source Count Report, 1997 Data

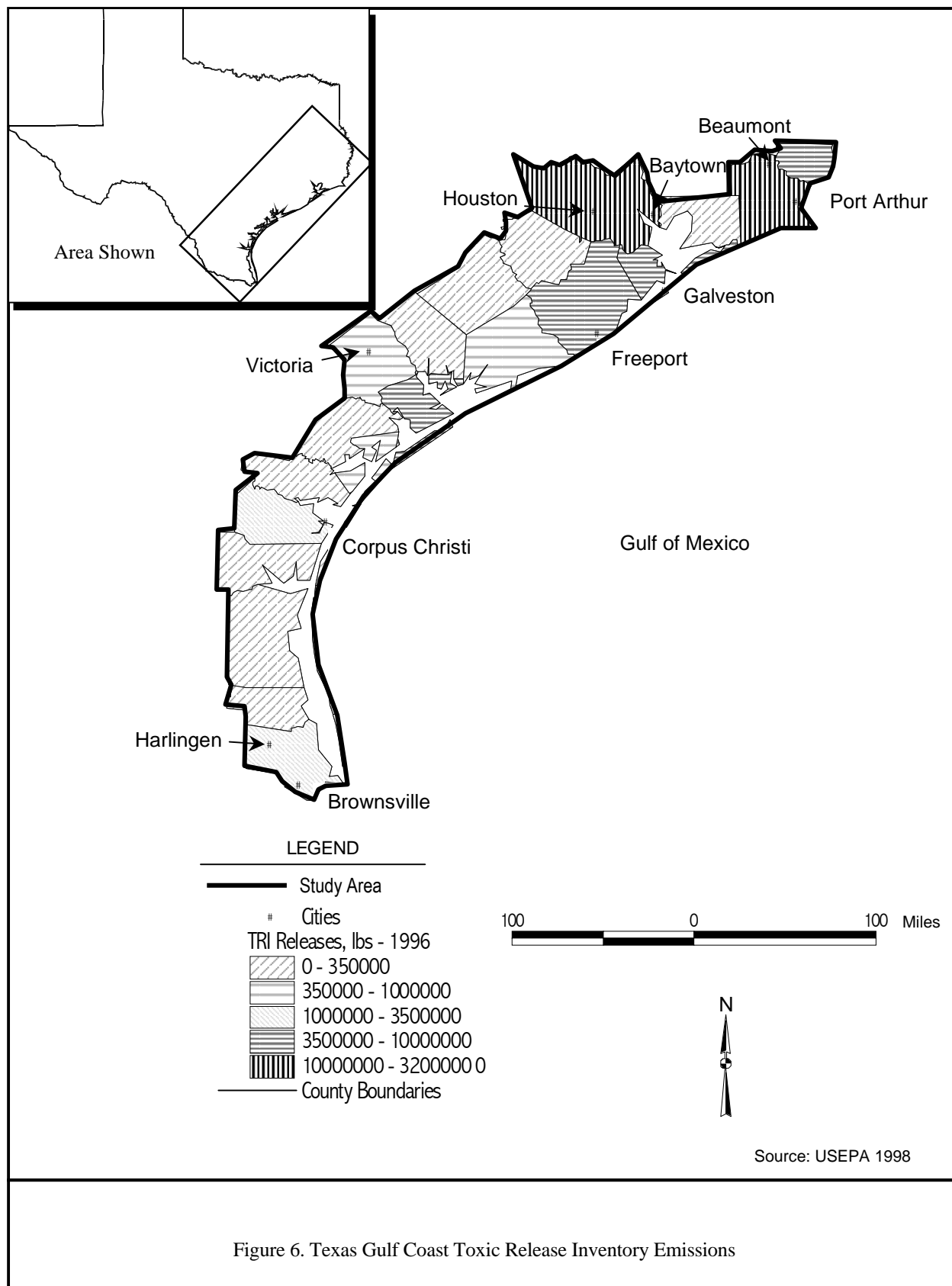
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Table 8 - TRI Total Air Toxics Emissions (lbs) by County for 1996 in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Fugitive Air	Stack Air	Total Toxic Air Releases
Aransas	NR	527,427	527,427
Brazoria	3,667,904	5,511,843	9,179,747
Calhoun	1,550,398	1,972,337	3,522,735
Cameron	664,572	466,087	1,130,659
Chambers	172,970	169,902	342,872
Fort Bend	52,202	64,652	116,854
Galveston	1,855,971	4,612,191	6,468,162
Harris	16,903,347	14,301,284	31,204,631
Jackson	NR	NR	NR
Jefferson	7,062,039	17,408,547	24,470,586
Kenedy	NR	NR	NR
Kleberg	NR	NR	NR
Matagorda	56,369	572,790	629,159
Nueces	1,186,453	1,617,197	2,803,650
Orange	2,264,248	4,127,658	6,391,906
Refugio	NR	NR	NR
San Patricio	89,590	22,913	112,503
Victoria	191,008	527,956	718,964
Wharton	3,656	66,488	70,144
Willacy	NR	NR	NR

Legend: lbs = pounds  
NR = Not Reported

Source: USEPA Toxic Release Inventory System[TRIS]1998



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The Pollutant Standards Index (PSI) has been developed by the USEPA to provide accurate, timely, and easily understandable information about daily levels of air pollution. The index provides USEPA with a uniform system of measuring pollution levels for the major air pollutants regulated under the Clean Air Act.. The intervals and the terms describing the PSI air quality levels are as follows:

0 to 50	=	good
50 to 100	=	moderate
100 to 200	=	unhealthful
200 to 300	=	very unhealthful
Above 300	=	hazardous

The EPA uses the Pollutant Standards Index to measure five major pollutants for which it has established National Ambient Air Quality Standards under the Clean Air Act. The pollutants are particulate matter (soot, dust, particles), sulfur dioxide, carbon monoxide, nitrogen dioxide, and ozone. For each of these pollutants, EPA has established air quality standards protecting against health effects that can occur within short periods of time (a few hours or a day). The PSI converts the measured pollutant concentration in a community's air to a number on a scale of 0 to 500. The PSI number of 100 corresponds to the maximum allowable concentration in the standards established under the Clean Air Act. Numbers higher than 100 exceed the established NAAQS and are regarded as unhealthful to hazardous. Table 9 shows PSI data for Texas Gulf Coastal Plains Counties for 1997 and a portion of 1998.

Table 9 - USEPA Pollutant Standards Index Data for Monitored Counties  
(Texas Gulf Coast)

County	Year	Total Days	<u>% of Days when Air Quality Was</u>			PSI Statistics		
			Good	Moderate	Unhealthful	Maximum	90th Percentile	Median
Brazoria	1997	364	79	19	1	140	62	34
Cameron	1997	363	94	6	0	73	48	29
Galveston	1997	365	71	26	3	179	69	41
Harris	1997	365	52	36	12	217	109	50
Jefferson	1997	365	70	29	1	143	70	39
Nueces	1997	365	82	18	0	81	57	35
Orange	1997	348	74	26	1	161	65	37
Victoria	1997	345	88	12	0	77	53	30
Brazoria	1998	120	72	28	0	92	63	42
Cameron	1998	120	84	16	0	67	56	41
Galveston	1998	119	61	37	2	145	67	46
Harris	1998	120	55	45	0	94	69	47
Jefferson	1998	119	83	17	0	67	54	41
Nueces	1998	120	80	20	0	90	59	40
Orange	1998	116	83	17	0	67	52	40
Victoria	1998	110	81	19	0	71	57	42

Source: USEPA - AIRSWeb Monitor PSI Report, 1-Oct-1998, Texas Air Quality Monitors (1997)

#### 1.5.5 Attainment Status

The 20 Texas Gulf Coast counties are in attainment with respect to NAAQS with the exceptions of ozone and ozone precursors. Episodes of elevated ozone levels are a serious and pervasive air quality problem because of the high industrial and urban emissions levels for ozone precursors (e.g., VOC and NO<sub>x</sub>) and the meteorology of the eastern Texas Gulf Coast. The USEPA announced a new NAAQS for ground-level ozone in July 1997. The previous one-hour standard will be phased out and replaced by an eight-hour standard (see Table 5). Seven counties in the Texas Gulf Coast study area are in non-attainment and several others are near non-attainment for ozone. These are in the Southern Louisiana-Southeast Texas, Houston-Galveston, and the Corpus Christi-Victoria areas. The Southern Louisiana-Southeast Texas non-attainment area includes Jefferson and Orange Counties and is classified as a "moderate" non-attainment area (USEPA 1998 ["GreenBook Homepage"]). The Houston-Galveston non-attainment area includes the counties of Brazoria, Chambers, Fort Bend, Galveston, and Harris and has been given a "severe" classification. A near-non-attainment area along the Texas Gulf Coast includes Victoria and Nueces Counties.

#### 1.5.6 Abatement Measures

Based on the presence of non-attainment status and severity classification, state and local environmental regulatory agencies are implementing a number of measures in the affected counties on a defined timetable as specified in the CAAA of 1990. The State Implementation Plan (SIP) for these non-attainment areas has been revised to reflect the plan for achieving attainment goals within a specified time period. For the Southern Louisiana-Southeast Texas "moderate" non-attainment area, the CAAA requires demonstration of attainment by November 1999. For the "severe" non-attainment area encompassing the Houston-Galveston area, attainment must be achieved by November 2007. Title III and Title V provisions of the CAAA of 1990 require that certain stationary sources are subject to air emissions measurements, reporting, and control for submission of operating permits. This process is the primary enforcement tool for implementing provisions of the CAAA and the SIP.

In 1983, formal efforts between the United States and Mexico to protect and improve the environment in the Border Area began with the adoption of the U.S.-Mexico Border Environmental Agreement, which was signed in October 1989. This agreement details the primary objectives of common border environmental cooperation; establishes a mechanism for additional agreements, annexes, and technical actions; and provides for regular high-level meetings and special technical meetings to further promote and encourage environmental cooperation between the two countries (USEPA 1992b, USEPA and Secretaria de Desarrollo y Ecologia [SEDUE] 1992). As part of the Agreement efforts, an "Integrated Environmental Plan for the Mexican - U.S. Border Area (First Stage, 1992-1994) was completed recently (USEPA and SEDUE 1992). However, this plan focuses on air quality problems of the larger "sister cities" such as El Paso - Ciudad Juarez and only marginally addresses the three counties of the Lower Coast of the Gulf Coastal Plains Province study area. The plan proposes no significant air quality planning requirements for this portion of the 3-county study area.

The Border XXI Program (Border XXI or Program) is an innovative binational effort which brings together the diverse U.S. and Mexican federal entities responsible for the shared border environment to work cooperatively toward sustainable development through protection of human health and the environment and proper management of natural resources in both countries. In *the US-Mexico Border XXI Program Framework Document* (EPA 160-R-96-003), October 1996, air pollution is seen by the public in the study area as a significant problem particularly with regard to the air quality impacts of high commercial vehicle traffic. More air quality monitoring in the region is necessary to fully understand the extent of air problems and to characterize the contribution of industry to air pollution within the binational air basins. Public concerns regarding the potential connection between air pollution and the incidence of neurological defects in the Southern Gulf Plains area have precipitated a request to commission a study to evaluate the nature of these potential associations. The U.S. and Mexico will continue baseline air quality monitoring. As more data are developed, both countries will be able to assess current air quality, and develop a strategy to prevent these areas from deteriorating into non-attainment of air quality standards. As in other areas in the border region, the development of technical capacity with an increase in the quantity and quality of source inventories will allow for development of a strategy to improve air quality in the region. EPA will support continued short-term air toxics investigations by TNRCC in the border area, using the TNRCC mobile sampling lab. (USEPA 1996)

## 1.6 Water Quality and Supply

### 1.6.1 Surface Water

#### 1.6.1.1 Major River Basins, Estuaries, and Reservoirs/Lakes

The Texas Water Development Board (TWDB) has been directed to prepare and maintain a comprehensive State Water Plan under Sections 16.051 and 16.055 of the Texas Water Code. The State Water Plan compiles water use and supply data from municipalities with 1,000 or more residents and rural areas. This data is arranged into 16 defined geographic regions with common water issues and regulatory goals. From a natural resource perspective, water has been identified as occurring in 15 major river basins and 8 coastal basins in Texas (Figures 7 and 8). Of these, 11 of the river basins drain at least a portion of the Texas Gulf Coast study area and, of course, all eight of the coastal basins are within this area (TWDB, August 1997). Twenty-five managed lakes and reservoirs are located in the Texas Gulf Coast region (Table 10). The river basins and coastal basins included within the Texas Gulf Coast study area along with water quality and water use data for each segment are listed in Appendix A and Appendix B. The Gulf Coast of Texas encompasses over 624 miles of shoreline on the Gulf of Mexico.

#### 1.6.1.2 Water Quality Standards

The Texas Surface Water Quality Standards (TSWQS) adopted by the TNRCC on March 19, 1997, recognize the regional geologic and hydrologic diversity of the state by dividing major river basins, reservoirs, bays, and estuaries into defined segments (referred to as classified segments). Appropriate water uses (such as aquatic life, contact recreation, oyster waters, etc.) are designated for each of the classified segments. Numerical criteria (chemical concentrations) established in the TSWQS provide a quantitative basis for evaluating use support and managing point and non-point loadings in Texas surface waters. These criteria are used as maximum instream concentrations that may result from wastewater discharges and contaminated runoff water. Texas Drinking Water Standards (TDWS) adopted by the TNRCC on June 4, 1977 and revised on November 25, 1994 assure the safety of public water supplies. The numerical criteria established in the TDWS for finished water (after treatment) provide a quantitative basis for evaluating support of the public supply use. Compliance with the TSWQS/TDWS is sometimes estimated from instream monitoring data using chemical concentration screening levels that establish compliance targets which can be directly compared with monitoring data. Screening levels are intended to provide the best comparisons that can be reasonably attained with available data and numerical criteria in the TSWQS/TDWS (TNRCC, SFR-58, June 1998).

The TSWQS in Title 30, Chapter 307 of the Texas Administrative Code [TAC] establish explicit water quality goals throughout the state. Sources that have shaped the development of these standards include: cities, industries, environmental interests, and USEPA, which has approval authority over state water quality standards. The TSWQS rule contains (1) general standards that apply to all surface water in the state, and (2) segment-specific standards that identify appropriate uses (aquatic life, contact or noncontact recreation, drinking water, etc.) that list upper and lower limits for common indicators (criteria) of water quality - such as dissolved oxygen, temperature, pH, dissolved minerals, and fecal coliform bacteria.

The TSWQS include several key sections that are essential to their overall effectiveness. The General Criteria (§307.4, TAC) (Appendix C) contain a variety of narrative statewide provisions that define the general goals to be attained by all waters in the state. These provisions are particularly important in dealing with those pollutants not addressed by specific numerical criteria. The General Criteria also specify procedures that are used to develop site-specific standards for small unclassified waterbodies.

The Antidegradation Policy (§307.5, TAC) establishes extra protection for high quality waterbodies. In accordance with EPA requirements, this policy stipulates that no degradation will be allowed in high quality waters, unless the resulting degradation is demonstrated to be economically and socially justified. The antidegradation policy also provides for establishing Outstanding National Resource Waters, in which no degradation is allowed under any circumstances.

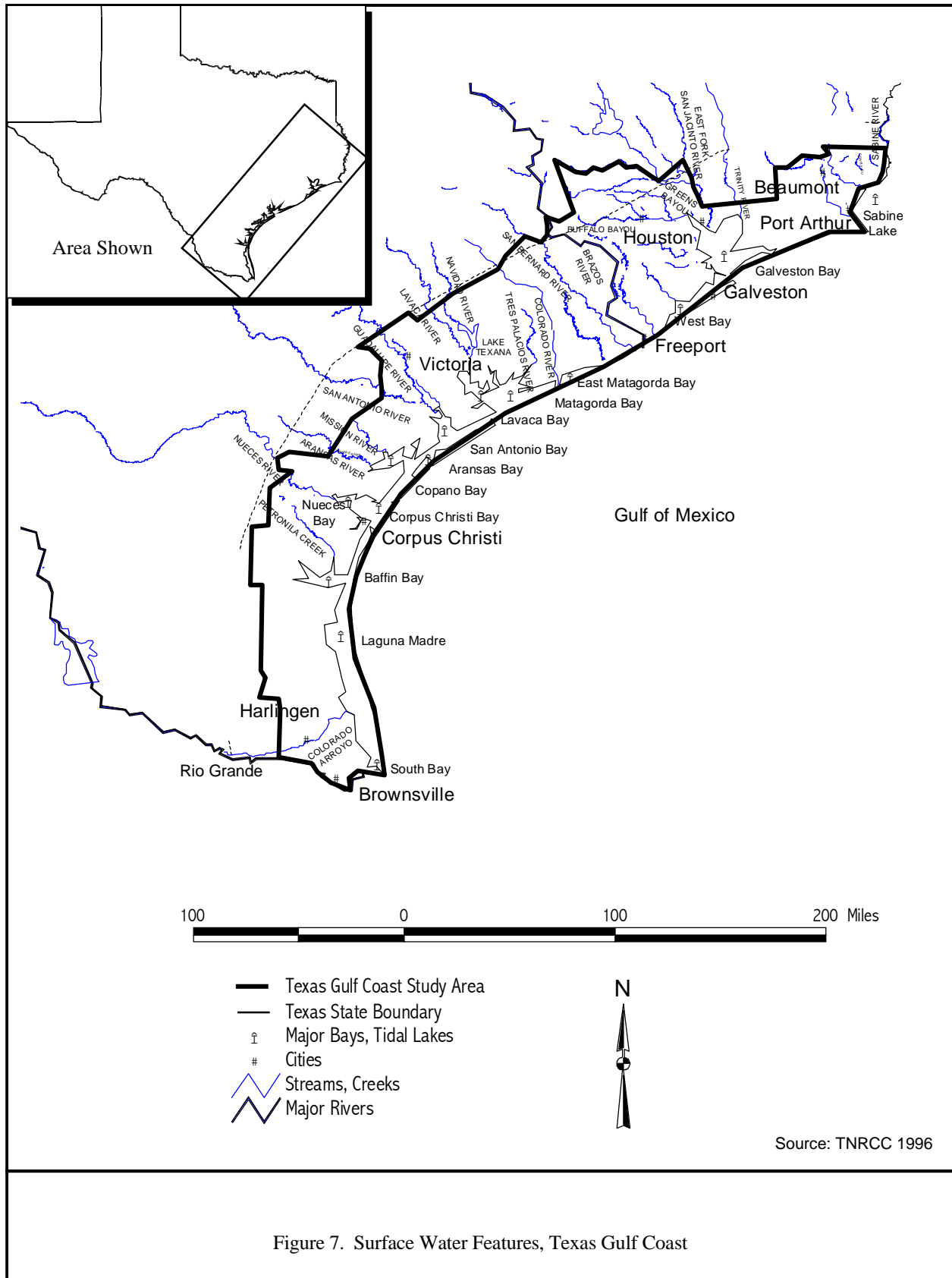
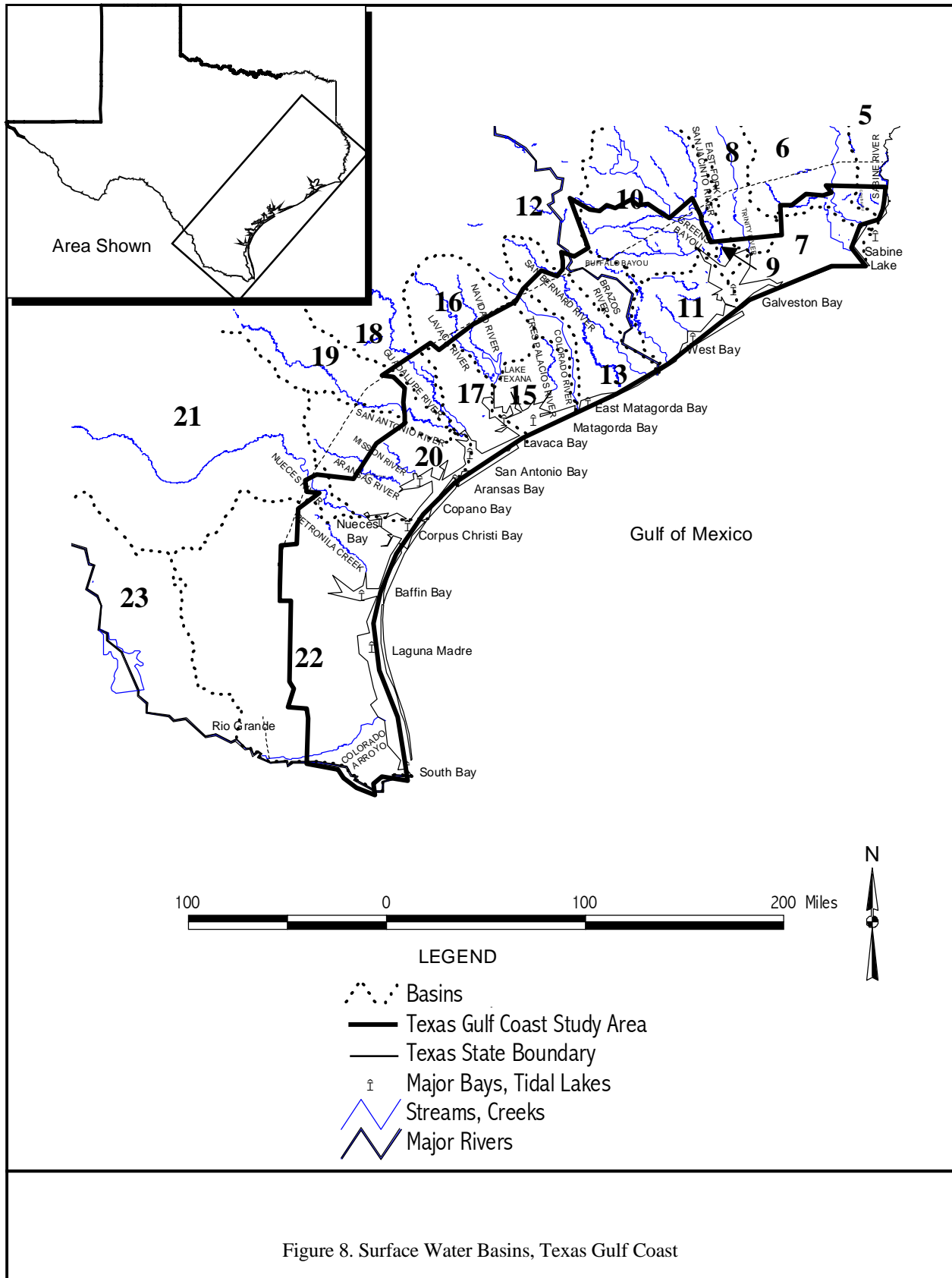


Figure 7. Surface Water Features, Texas Gulf Coast



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Table 10 - Major Reservoirs/Lakes in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Name	County	River/Stream/Bay	Purpose/Remarks	Owner	Area (ac)	Storage (ac-ft)	City/Town
Brazoria Reservoir	Brazoria	off channel	industrial supply	Dow Chemical Co.	1,865	21,970	Brazoria
Harris Reservoir	Brazoria	Brazos R./Oyster Ck.	industrial supply	Dow Chemical Co.	1,663	12,000	Angleton
Mustang Lake E & W	Brazoria	Mustang Bayou	multi-purpose	Chocolate Bayou Land and Water Co.	--	6,451	Alvin
San Bernard Reservoirs #1, #2, #3	Brazoria	San Bernard River	industrial supply	Phillips 66 Co.	--	8,610	Sweeney
Cox Lake	Calhoun	n/a	industrial supply		541	4,900	n/a
Loma Alta Lake	Cameron	Rio Grande	municipal, industrial	Brownsville Navigation Dist.	2,490	26,500	Brownsville
Anahuac Lake	Chambers	Turtle Bayou	irrigation, industrial, mining	Chambers/Liberty C. Navigation District	5,300	35,300	Anahuac
Cedar Bayou Cooling Reservoir	Chambers	Cedar Bayou	power plant, industrial	Houston Lighting & Power	2,600	20,000	Anahuac
Wallisville Lake	Chambers,- Liberty	Trinity	multi-purpose	US Army Corps of Engineers	19,700	58,000	Wallisville
Smithers Lake	Fort Bend	Dry Creek	industrial supply	Houston Lighting & Power	2,480	18,700	Richmond
Galveston County Industrial Water Reservoir	Galveston	Dickinson Bayou	industrial supply	Galveston Co. Water Authority	812	7,308	La Porte
Addicks Reservoir	Harris	Horsepen Ck.	dry; flood control		--	--	Houston
Lake Houston	Harris	San Jacinto River	multi-purpose	City of Houston	12,240	140,500	Sheldon
Sheldon Reservoir	Harris	Carpenters Bayou	fish hatchery, recreation	Texas Parks and Wildlife Dept.	1,700	5,420	Sheldon
Barker Reservoir	Harris, Fort Bend	Buffalo Bayou	dry; flood control		--	--	Houston
Anzalduas Channel Dam	Hidalgo	Rio Grande	irrigation, flood control	US/Mexico	--	8,400	Hidalgo
Delta Lake Reservoirs 1 & 2	Hidalgo	Rio Grande	irrigation	Hidalgo/Willacy WC&ID No. 1	2,371	25,000	Monte Alto
Retama Reservoir (a.k.a. Edinburg Lake)	Hidalgo	Rio Grande	irrigation	Santa Cruz #15	--	5,000	Edinburg
Valley Acres Reservoir	Hidalgo	Rio Grande	multi-purpose	Valley Acres Water District	906	7,840	Mercedes
Lake Texana (a.k.a. Palmetto Bend Res.)	Jackson	Navidad River/Sandy Ck.	municipal, irrigation	US Bureau of Reclamation, Lavaca-Navidad River Auth., TWDB	11,000	157,900	Edna
Big Hill Reservoir (J. D. Murphee WMA)	Jefferson	Big Hill/Taylor Bayou	Wildlife management area	Texas Parks and Wildlife Dept.	6,881	13,500	Port Acres
South Texas Project Reservoir	Matagorda	Colorado River	industrial supply	Houston Lighting & Power	7,000	187,000	Bay City
Barney M. Davis Cooling Reservoir	Nueces	Laguna Madre	power plant	Central Power & Light	1,100	6,600	Corpus Christi
Corpus Christi Lake	San Patricio, Live Oak, Jim Wells	Nueces River	Multi-purpose	Lower Nueces River WSD	19,336	269,900	Mathis
Coletto Creek Reservoir	Victoria, Goliad	Coletto Ck.	industrial supply	Guadalupe-Blanco River Auth.	3,100	35,080	Victoria

Source: Texas Almanac, 1997

Standards for Toxic Materials (§307.6 TAC) include numerical criteria (as maximum instream concentrations) for 39 toxic pollutants in order to protect aquatic life. Human consumption of fish and drinking water is protected by numerical criteria for 64 toxic pollutants. This section also requires larger wastewater dischargers to conduct biomonitoring, which involves exposing selected aquatic organisms to samples of the discharge effluent. Any significant toxicity observed during biomonitoring must then be evaluated and eliminated.

Appropriate numerical criteria needed to support various water-quality related uses are defined in §307.7 TAC. Conditions under which portions of the standards do not apply, such as in mixing zones near discharge points or at unusually low stream flows, are noted in §307.8 TAC. Sampling and analytical procedures to assess standards attainment are described in §307.9 TAC. Site-specific standards for designated waterbodies are individually listed in §307.10 TAC.

Procedures for implementing the Texas Surface Water Quality Standards are described in "Implementation of the TNRCC Standards Via Permitting (TNRCC, 19 )."

Water quality standards are publicly revised at least every three years in order to incorporate new information on potential pollutants and additional data about water quality conditions in specific waterbodies, and to address new state and federal regulatory requirements.

The current standards were adopted by the TNRCC on June 14, 1995, and became effective as of July 13, 1996. These standards incorporate new criteria that were added for eight toxicants, and criteria for silver that were revised to be less stringent. Based on new drinking water standards, criteria for eight toxicants were revised to be more stringent, and criteria for four toxicants were revised to be less stringent. A provision was added to allow control of diazinon toxicity through measures other than whole-effluent toxicity limits. Dissolved oxygen criteria for streams in south and east Texas were adjusted in accordance with site-specific stream flow and stream slope. More protective standards were adopted for the Colorado River below Austin and for the San Marcos River.

In December 1997, the TNRCC announced its plans to implement a statewide initiative to improve water quality with the cooperation of local, state, and federal agency partners. This initiative involves the development and implementation of "total maximum daily loads" (TMDL) criteria in watersheds which are used to measure the amount of pollution a water body can receive and still meet surface water quality standards for its designated uses. TMDLs are developed and implemented for impaired water bodies in which standards are exceeded for specific pollutants. The time frame for completing this initiative statewide is ten years and a schedule for this program has been submitted for compliance with Section 303(d) of the 1998 Clean Water Act, Title 40 Code of Federal Regulations, Section 130.7 and other USEPA guidance. Appendices A and B list the classified segments and their recent water quality status within the Texas Gulf Coast study area including segments named on the Section 303(d) list. Appendices D and E list these classified segments and the status of the designated uses they support. TDS & chlorine are not reported/measured in Appendix E since these segments are in areas with naturally occurring elevated concentrations.

#### 1.6.1.3 Water Quality Monitoring

The TNRCC, through its Surface Water Quality Monitoring (SWQM) program collects water quality data from as many as 465 listed monitoring stations in the Texas Gulf Coastal Plains province (Table 11). A listing of these SWQM stations by individual identification number, type, and location is provided in Appendix F (Surface Water Quality Monitoring Stations, Texas Gulf Coast). The major types of surface water monitoring at these stations include toxic substance, Toxicology Data Network (TOXNET), ecoregion, and biological. The type of sampling and analyses performed for a given monitoring station depends upon the designated uses of the segment, the types of contamination that a segment is likely to receive, or other specified indicators. Additional monitoring of water quality and hydrologic parameters is also conducted by the U.S. Geological Survey (USGS) within various river basins in the study area. The International Boundary Water Commission (IBWC) also performs monitoring, predominantly within the Rio Grande river basin (IBWC 1989, 1992; Buckner and Shelby 1990a, 1990b, 1990c; TNRCC 1996).

Table 11 - Surface Water Quality Monitoring Stations, Texas Gulf Coastal Plains Province  
(Texas Gulf Coast)

Segment Id.	No. of Monitoring Sta.	Segment Id.	No. of Monitoring Sta.
701	16	2004	20
702	22	2201	68
703	10	2202	54
704	10	2203	2
901	9	2204	10
902	7	2422	2
1101	6	2423	2
1102	14	2424	8
1103	17	2425	5
1104	14	2426	18
1105	9	2431	1
1107	7	2432	2
1108	6	2441	1
1110	14	2452	1
1111	1	2453	4
1113	18	2454	1
1301	2	2456	2
1302	4	2461	1
1304	15	2462	3
1305	9	2463	1
1501	4	2472	1
1502	15	2473	1
1701	2	2481	2
2001	1	2483	1
2002	1	2485	4
2003	3	2492	14
Total Stations:		465	

Source: TNRCC 1997

The IBWC, in accordance to the 1944 Water Treaty, is an international body composed of a U.S. Commissioner and a Mexican Commissioner each appointed by the president of his respective country. These commissioners and their staff, headquartered in El Paso, Texas, and Ciudad Juarez, Chihuahua, respectively, provides the U.S. and Mexico with a binational institution that enables application of the various boundary and water treaties and other agreements by technical experts along the U.S/Mexico boundary (IBWC 1993).

Galveston Bay, the most urbanized (and most utilized) estuary, is subject to a wide variety of specific problems resulting from human activity. As part of the National Estuary Program established by the Water Quality Act of 1987, the Administrator of the USEPA has the authority to convene management conferences to develop Comprehensive Conservation and Management Plans (CCMPs) for estuaries of national significance that are threatened by pollution, development, or overuse. The Galveston Bay National Estuary Program (GBNEP) began on September 1, 1989 and was developed over a six-year effort. The GBNEP was the first to be approved by the USEPA without changes or revisions and is used as a model for other NEP development. The following objectives were accomplished:

- identification of environmental problems (i.e., reduction/alternation of living resources, public health and resource management issues, shoreline erosion) facing the bay;
- establishment of a Data and Information Management System;

- Compilation of historical and new data to evaluate trends and for identification of environmental problems; and
- Completion of a CCMP for management of the estuary (TNRCC 1997).

The USEPA also designated Corpus Christi Bay in 1992 as a participant of the National Estuary Program (NEP). Corpus Christi National Estuary is a large, complex estuarine ecosystem in the semi-arid region of South Texas. There are about 350,000 acres of bay and marshlands covering the estuarine environment along 75 linear miles of Texas Gulf coastline in 12 counties. The area includes all bays in the Corpus Christi, Aransas, and upper Laguna Madre estuaries as well as all saltwater bayous. Within the Corpus Christi Bay system is Padre Island, the longest barrier island in the world, and Laguna Madre, a rare hypersaline estuarine lagoon. The management program will assess the extent of problems associated with limited freshwater resources, point and non-point discharges, habitat losses, endangered species, persistent algal blooms, and continued petrochemical production and shipping (TNRCC 1997).

#### 1.6.1.4 Major Excursions and Potential Sources

Water quality assessments for the Texas Gulf and Rio Grande hydrologic regions indicated that the major causes of stream/riverine excursions included fecal coliform bacteria, organic enrichment/dissolved oxygen, nutrients, salinity/total dissolved solids/chloride, and toxics (including pesticides, metals, and priority organics). The relative contribution of sources to non-support of assigned uses in streams and rivers are as follows: municipal and industrial point sources, non-point sources, natural, and unknown. Appendix D lists the surface water segments for the study area and contamination data for each. In the Texas bays and estuaries, the major types of pollutants were identified as fecal coliform bacteria and toxics (including metals and priority organics). Major sources of pollutants contributing to non-attainment of uses were municipal and industrial point sources. Appendix E lists the coastal water basins in the study area.

Another source of potential pollution is untreated or partially treated wastewater discharges. In some regions of the border area, particularly where flow into rivers that form the international boundary between Mexico and the U.S. have unsanitary conditions due to inadequate treatment or collection facilities. Within the study area, the sister cities of Matamoros, Mexico and Brownsville, Texas are considered as one of the major contributors of waste discharges into the Rio Grande. Matamoros, Tamaulipas, along with 20 other municipalities in Mexico, are also considered as major contributors of waste discharges into the Gulf of Mexico.

In 1983, formal efforts between the United States and Mexico to protect and improve the environment in the border area began with the adoption of the U.S.-Mexico Border Environmental Agreement, which was signed in October, 1989. This agreement details the primary objectives of common border environmental cooperation; establishes a mechanism for additional agreements, annexes, and technical actions; and provides for regular high-level meetings and special technical meetings to further promote and encourage environmental cooperation between the two countries (USEPA and SEDUE 1992). As part of the Agreement efforts, an "Integrated Environmental Plan for the Mexican - U.S. Border Area (First Stage, 1992-1994) was completed recently (USEPA and SEDUE 1992). The surface water implementation plans in this document call for a number of measures (i.e., collection, treatment and disposal facilities) which should result in improved water quality along the U.S.- Mexico border such as the Bajo Rio Bravo/Lower Rio Grande (e.g., Matamoros/Brownsville area) planning efforts (USEPA 1992b).

The Border XXI Program (Border XXI or Program) is an innovative binational effort which brings together the diverse U.S. and Mexican federal entities responsible for the shared border environment to work cooperatively toward sustainable development through protection of human health and the environment and proper management of natural resources in both countries. The *US-Mexico Border XXI Program Framework Document* (EPA 160-R-96-003), October 1996, states that water supplies in the Lower Rio Grande are limited, and increasing demands are a growing problem. Shared water of the Rio Grande and its tributaries from below international Amistad Dam to the Gulf of Mexico is currently the primary source for meeting all uses on both sides of the border. As population and water demands increase, the use of groundwater may also increase as competing water needs include municipal and industrial use. It is necessary to protect water quality in the Rio Grande, adjacent streams, oxbows (resacas), bays, estuaries, and aquifers. Controlling point and nonpoint biological and chemical pollution demands effective enforcement.

Other water-related issues raised by local residents include illegal dumping of waste in water bodies that flow into the Rio Grande; the need for domestic water supply and the lack of coordination of infrastructure services in the colonias; the need for a binational watershed plan; the negative impact ocean dumping has on the fishing industry and on beaches; and the need for cleanup of the small lakes and oxbows along the Rio Grande. The Gulf of Mexico beaches near Brownsville were cited as areas of concern for surface water quality.

Valle Hermoso and Matamoros are constructing aqueducts as part of the decommissioning of intakes from the irrigation district. Nuevo Laredo has constructed a new treatment plant and another treatment plant is planned in Matamoros. The efforts to protect surface and groundwater resources requires improvement of the urban infrastructure associated with the supply of drinking water and the disposal of wastewater. Recognizing the importance of the Rio Grande to sustainable development, the U.S. and Mexico will work together on a watershed-based analysis of drinking water and wastewater infrastructure needs for the cities, towns, and communities near the river. EPA and Mexico's National Water Commission [Comisión Nacional de Agua] (CNA) will continue to work with the IBWC and the Border Environmental Cooperation Commission (BECC) to facilitate the development of the Rio Grande Cities Facilities Planning projects.

The TNRCC and EPA will continue to share information with CNA and other appropriate Mexican authorities regarding the creation of the Rio Grande Alliance, taking into consideration the concept of basin management in Mexico. U.S. and Mexican state and federal agencies will continue discussions regarding managing their ecosystem and watershed activities. Comprehensive planning for the Rio Grande watershed will help both governments develop solutions to identified water quality problems. Similar collaboration of efforts will be encouraged along the rest of the border.

The U.S. and Mexico will continue to work together to complete the ongoing Rio Grande water quality studies, begin analysis of the data, and evaluate the need for additional monitoring.

Segments within the different surface water basins of the study area which show no significant water quality problems include the Sabine River Tidal (Sabine River), Intercoastal Waterway and Sabine Neches Canal (Neches-Trinity Coastal), Bastrop Bayou and Old Brazos River Channel (San Jacinto-Brazos Coastal), Navidad River below Lake Texana and Lake Texana (Lavaca River), Victoria Barge Canal (Lavaca-Guadalupe Coastal), and the Mission River Tidal and Aransas River Tidal (San Jacinto-Nueces Coastal).

The Gulf of Mexico and the following bays located within the different coastal water basins of the study area exhibit good water quality. These bays include Sabine Lake, Sabine Pass, Bastrop, Oyster, and Christmas Bays (Neches-Trinity Coastal); East Matagorda Bay (Brazos-Colorado Coastal); Espiritu Santo Bay (Lavaca-Guadalupe Coastal); Mesquite, Carlos and Ayres Bays (San Antonio-Nueces Coastal); Corpus Christi Inner Harbor, Baffin and Alazan Bays, Cayo del Grul, Laguna Salada, and the Brownsville Ship Channel (TWC 1992a).

#### 1.6.1.5 Surface Water Uses and Yields

The major uses of water in the study area are municipal (public and domestic), manufacturing (industrial), steam-electric power, mining (e.g., recovery of crude petroleum), irrigation, and livestock. Surface water uses identified by the Texas Water Development Board (TWDB) and projected surface water balance data for the year 2000 in each coastal basin are listed in Table 12. Appendices D and E list the designated surface water uses and quality criteria for each river and coastal basin (TNRCC 1996; TWDB 1997).

Surface water use in Texas is expected to increase from 7.1 million acre-feet in 1994 to 10.3 million acre-feet by the year 2050. Municipal use of this water is projected to increase from approximately two million acre-feet (1994) to nearly five million acre-feet by 2050. The increase of surface water supply development is necessary to accommodate decreases in groundwater availability due to over-pumping and decreasing groundwater quality.

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Table 12 - Estimated Water Balances of the Coastal Basins of Texas for Year 2000 (Acre-Feet)  
(Texas Gulf Coast)

	<b>Neches- Trinity</b>	<b>Trinity-San Jacinto</b>	<b>San Jacinto- Brazos</b>	<b>Brazos- Colorado</b>	<b>Colorado- Lavaca</b>	<b>Lavaca- Guadalupe</b>	<b>San Antonio- Nueces</b>	<b>Nueces-Rio Grande</b>
<u>In-Basin Demands</u>								
Municipal	33,979	20,163	145,593	15,624	40,008	7,726	17,511	272,103
Manufacturing	80,120	78,456	184,246	21,347	16,673	46,069	14,251	49,964
Steam Electric	0	1,100	3,000	0	100	0	0	3,450
Mining	480	9,590	571	3,544	329	779	367	6,285
Irrigation	218,056	31,774	148,714	258,451	139,277	46,140	4,053	1,169,980
Irrigation Adjustment	0	0	0	-14,743	0	-3,629	0	-204,617
Livestock	1,005	265	1,094	1,827	955	1,155	2,222	7,774
Total In-Basin Demands	333,640	141,348	483,218	286,050	197,342	98,240	38,404	1,304,939
<u>In-Basin Supplies</u>								
Groundwater	8,924	19,537	65,638	75,439	80,816	27,163	11,087	49,051
Surface Water	18,380	6,160	39,978	24,132	5,813	1,356	862	3,973
Total In-Basin Supplies	27,304	25,697	105,616	99,571	86,629	28,519	11,949	53,024
<u>Transfers</u>								
Import Supplies	306,336	115,612	377,602	186,481	74,713	69,721	26,455	1,251,915
Export Demands	0	0	0	0	0	0	0	0
<u>Additional New Supplies</u>	0	0	0	0	0	0	0	0
<u>Net Availability</u>	0	0	0	0	0	0	0	0

Source: Texas Water Development Board, 1997

The following summaries are compiled for each planning region as described in the Texas State Water Plan (TWDB 1997):

**East Texas Region:** Beaumont and Port Arthur obtain surface water from the Neches River and Lake Sam Rayburn. During low water flow in the Neches River, saltwater intrusion tends to contaminate freshwater supplies at existing intake facilities. A barrier to prevent this intrusion of saltwater is being devised for installation on the Lower Neches River. Completion of this structure will ensure adequate surface water supplies for these areas.

**Houston Region:** Surface water supplies this region with 67 percent of its demands but is projected to supply over 80 percent by the year 2050 due to imposed limitations on groundwater use. Large pipelines, distribution systems, and treatment facilities are planned for imported water supplies to meet these needs. Another concern in this region is adequate freshwater inflows to ecological systems along the coastal area.

**Mid-Coast Region:** Surface water use in this region is approximately 1 million acre-feet per year with a decline in agricultural use anticipated by 2050. Projected estimates indicate that current supplies are adequate and with conservation measures and infrastructure improvements, future demands will be met within the region.

**Coastal Bend Region:** This region, which includes the Nueces and San Antonio River Basins, is projected to increase its water use nearly 61 percent by 2050. Municipal and industrial usage accounts for most of this increase. There are insufficient resources within the region to provide water for these projections. A freshwater pipeline is under construction from Lake Texana to provide additional water to the city of Corpus Christi. Additional supplies are needed, particularly in the event of extended drought periods.

**Lower Rio Grande Region:** This region is one of the fastest growing areas in the state and is also a major agricultural area that used nearly 10 percent of the State's water in 1990. A decline in agricultural water use but increases in municipal uses is forecast for this region. Surface water is distributed through existing open canal systems throughout the Lower Rio Grande Valley. Concerns regarding contamination of these open systems and the need for treatment facilities are the focus of regional planners. Water allocations in the region are dictated by international agreements and supplies extend from Falcon and Amistad International Reservoirs.

## 1.6.2 Groundwater

### 1.6.2.1 Major Aquifers

Seven major aquifers collectively supply most of the groundwater used in Texas. Within the Texas Gulf Coast segment of the study area, the Gulf Coast aquifer system underlies an area from the coastline to 100 miles inland and extends from the Rio Grande Valley northeastward into Louisiana (Figure 9). It is a multiaquifer system that consists of interbedded and interfingering beds of sand, silt, clay, and gravel. This large artesian system commonly ranges in depth from 200-1,500 feet but may extend to depths of more than 3,000 feet. Yields of large-capacity wells range from 300-1,500 gallons per minute with maximum yields exceeding 4,500 gallons per minute (Baker 1985; TWC 1992a).

### 1.6.2.2 Groundwater Quality

Groundwater is the primary source of drinking water in the study area. In 1988, the Texas Department of Health established maximum acceptable concentration levels for inorganic and organic constituents for drinking water (Table 13). This complies with the requirements of P.L. 93-523, the Federal "Safe Drinking Water Act," and the "Interim Primary Drinking Water Regulations" which have been promulgated by the USEPA. The maximum contaminant level for a pollutant that is allowed in drinking water is the established maximum limit of that contaminant which causes no adverse effects on human health. Secondary levels, usually based on aesthetic reasons such as taste, color, odor, staining, and scaling, are recommended limits, except for water systems not in existence as of the effective date for that standard (TNRCC).

The USEPA(199 ) describes the initial development of the basic assumptions and methodology for evaluating the vulnerability of groundwater resources. This system has been utilized by the TNRCC to produce maps with color-coded areas delineating varying degrees of potential impact to groundwater throughout the State of Texas. These maps were used to summarize groundwater pollution potential by county in the study area. The USEPA methodology (called DRASTIC) evaluates seven measurable parameters, or factors, for each hydrogeologic setting summarized as follows:

**D** - Depth to water

**R** - Annual net recharge of water which reaches the aquifer

**A** - Aquifer media-the geologic material of which the aquifer is composed

**S** - The soil media or sedimentary material and its thickness

**T** - Topographic relief, expressed as percent slope

**I** - Impact of the vadose zone material (near surface soil)

**C** - Hydraulic conductivity, a measure of the aquifers' ability to transmit water or other fluids

These factors are combined in determining an index for ground water pollution potential. Each factor is given a rating from 1 to 10. Each DRASTIC parameter is assigned a weight ranging from 1 to 5. The weighting represents an attempt to define the relative importance of each factor in its ability to affect pollution transport to and within the aquifer. Each parameter rating is multiplied by the weighting to arrive at a value for the parameter. These values are then summed to arrive at the DRASTIC index number that represents a relative measure of the ground water pollution potential of each hydrogeologic setting. Table 14 is a summary of DRASTIC analyses for the Texas Gulf Coastal areas. In general, this region is moderately to highly susceptible to groundwater contamination due to the combination of factors described by the DRASTIC indices.

#### 1.6.2.3 Potential Sources of Contamination

Groundwater assessments within the study area for the Gulf Coast Aquifer indicate that the most common sources for potential contamination include: (1) current groundwater withdrawals, particularly for municipal and manufacturing purposes, and a corresponding decline in artesian pressure which have caused land surface subsidence, saline water encroachment, surface fault activation, and serious water level declines; (2) high chloride levels east of the San Marcos Arch with increased chloride/sulfate concentrations west of the Arch that exceed Secondary Drinking Water Standards; (3) higher levels of total dissolved solids (range 1,000-1,500 mg/l) with levels exceeding 10,000 mg/l in the southern part of the aquifer; (4) organics (hydrocarbons), metallic substances, inorganic acids, microorganisms, and radionuclides from confirmed leaking underground storage tanks (LUST); (5) hazardous wastes from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Underground Injection Control (UIC) sites; (6) scale or corrosion inhibitors from air conditioning return flow wells in the upper portion of the aquifer; and (7) natural/man-made low levels of nitrate (0-20 percent), except in the extreme upper portion of the aquifer (41-60 percent), and fluoride (0-3 percent), except in the southern portion of the aquifer (11-20 percent), that continually exceed the federal drinking water standards. Table 15 lists additional sources of potential contaminants by aquifer and associated surface water basin in the study area (Strause 1988; TWC 1989, 1992a).

Another potential source of pollution is untreated or partially untreated wastewater and industrial wastes which may pose a risk to transboundary groundwater. In some regions of the border area, namely where waters flow into rivers that form the international boundary between Mexico and the U.S., have inadequate management and treatment facilities for wastewater and industrial/hazardous wastes. Within the study area, the sister cities of Matamoros/Brownsville are considered as one of the major contributors of waste discharges into the Rio Grande.

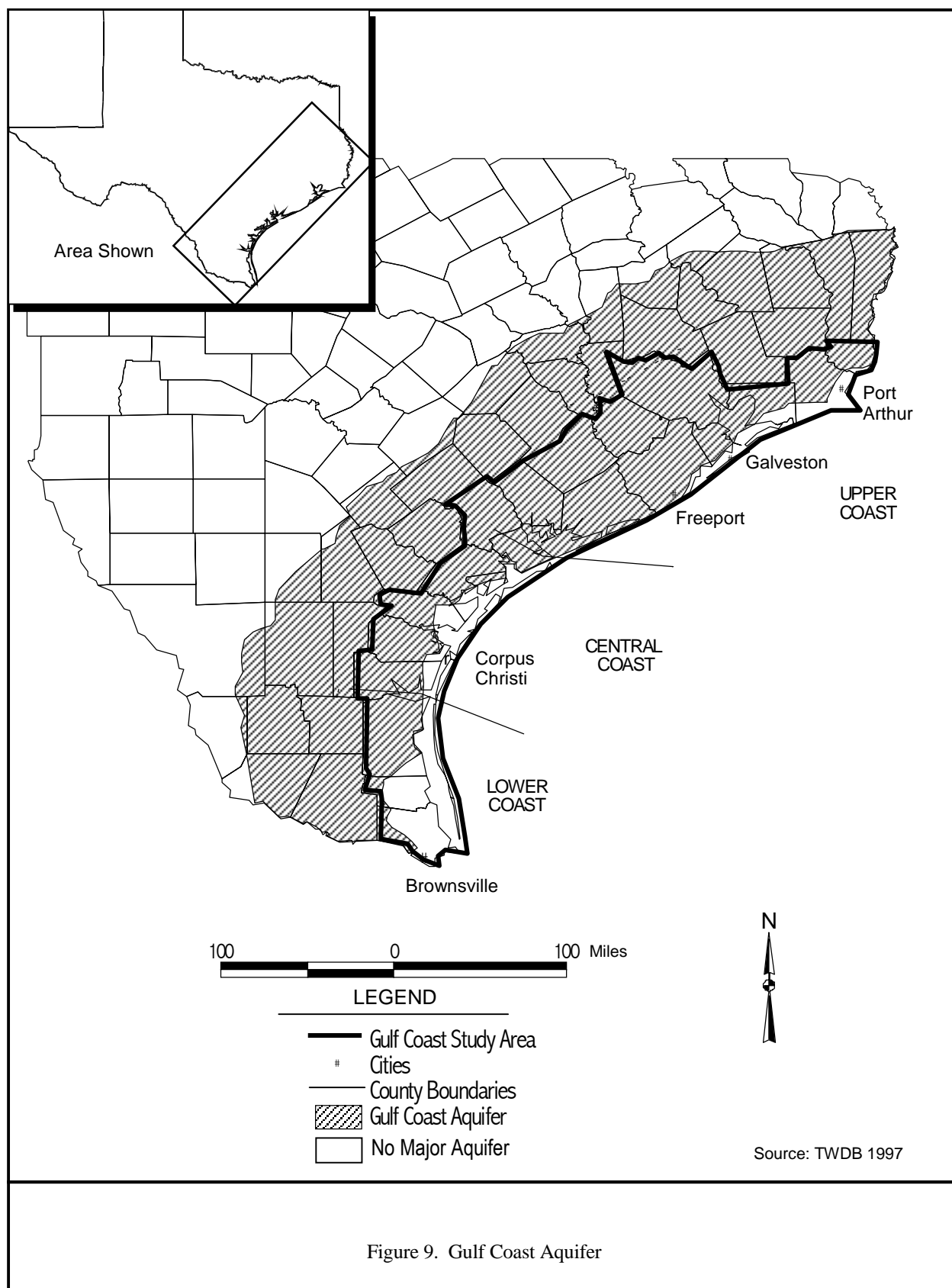


Table 13 - Drinking Water Standards For Public Water Supply Systems In Texas  
Standards of Chemical Quality

Inorganic chemicals. The maximum contaminant levels (MCL) for inorganic contaminants listed below apply to community and non-transient, non-community water systems. The maximum contaminant levels for nitrate, nitrite, and total nitrate and nitrite also apply to transient non-community water systems.

<b>Contaminant</b>	<b>Maximum Contaminant Levels (mg/l)</b>
Antimony	0.006
Arsenic	0.05
Asbestos	7 million fibers/liter (longer than 10 microns)
Barium	2.0
Beryllium	0.004
Cadmium	0.005
Chromium	0.1
Cyanide(as free Cyanide)	0.2
Fluoride	4.0
Mercury	0.002
Nickel	0.1
Nitrate(as Nitrogen)	10.0
Nitrite(as Nitrogen)	1.0
Nitrate Nitrite (Total)(as Nitrogen)	10.0
Selenium	0.05
Thallium	0.002

Note: Fluoride. Maximum contaminant level for fluoride in community water systems is 4.0 mg/liter. Also, see § 290.113 of this title (relating to Recommended Secondary Constituent Levels Applicable to All Public Water Systems) which establishes a recommended secondary constituent level of 2.0 mg/liter.

Volatile organic chemicals (VOCs). The following maximum contaminant levels for volatile organic contaminants apply to community and non-transient, non-community water systems.

<b>Contaminant</b>	<b>Maximum Contaminant Levels (mg/l)</b>
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
1,2-Dichloroethane	0.005
1,2-Dichloropropane	0.005
1,2,4-Trichlorobenzene	0.07
Benzene	0.005
Carbon tetrachloride	0.005
cis-1,2-Dichloroethylene	0.07
Dichloromethane	0.005
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
para-Dichlorobenzene	0.075
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1.0
trans-1,2-Dichloroethylene	0.1
Trichloroethylene	0.005
Vinyl chloride	0.002
Xylenes (total)	10.0

Table 13 - Drinking Water Standards For Public Water Supply Systems In Texas (continued)  
Standards of Chemical Quality

Synthetic organic chemicals (SOCs). The following maximum contaminant levels for synthetic organic contaminants apply to community and non-transient, non-community water systems.

<b>Contaminant</b>	<b>Maximum Contaminant Levels (mg/l)</b>
Alachlor	0.002
Aldicarb	0.003
Aldicarb Sulfoxide	0.004
Aldicarb Sulfone	0.002
Atrazine	0.003
Benzo[a]pyrene	0.0002
Carbofuran	0.04
Chlordane	0.002
Dalapon	0.2
Dibromochloropropane	0.0002
Di(2-ethylhexyl) adipate	0.4
Di(2-ethylhexyl) phthalate	0.006
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylene dibromide	0.00005
Glyphosate	0.7
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.04
Oxamyl (Vydate)	0.2
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated biphenyls (PCB)	0.0005
Simazine	0.004
Toxaphene	0.003
2,3,7,8-TCDD (Dioxin)	0.0000003
2,4,5-TP	0.05
2,4-D	0.07

Source: Title 30 TAC, Environmental Quality Part I. Texas Natural Resource Conservation Commission, Chapter 290. Water Hygiene Subchapter F)

Table 14 - Groundwater Pollution Potential Based on DRASTIC Indices  
(Texas Gulf Coast)

<b>County</b>	<b>General Description of Conditions</b>
Aransas	Nearly the highest groundwater pollution potential in Texas
Brazoria	Moderately high groundwater pollution potential
Calhoun	Nearly the highest groundwater pollution potential in Texas
Cameron	Nearly the highest groundwater pollution potential in Texas
Chambers	Moderately high groundwater pollution potential
Fort Bend	Moderately high groundwater pollution potential
Galveston	Moderately high groundwater pollution potential
Harris	Moderately high groundwater pollution potential
Jackson	Nearly the highest groundwater pollution potential in Texas
Jefferson	Moderately high groundwater pollution potential
Kenedy	Moderately high groundwater pollution potential
Kleberg	Moderate groundwater pollution potential
Matagorda	Nearly the highest groundwater pollution potential in Texas
Nueces	Moderate groundwater pollution potential
Orange	Highest groundwater pollution potential in Texas
Refugio	Nearly the highest groundwater pollution potential in Texas
San Patricio	Nearly the highest groundwater pollution potential in Texas
Victoria	Moderately high groundwater pollution potential
Wharton	Moderately high groundwater pollution potential
Willacy	Moderate groundwater pollution potential

Source: [tnrcc.state.tx.us/water/wpa/gw/drasdef.html](http://tnrcc.state.tx.us/water/wpa/gw/drasdef.html)

As part of the 1989 Agreement efforts, an "Integrated Environmental Plan for the Mexican - U.S. Border Area (First Stage, 1992-1994) was completed recently (USEPA and SEDUE 1992). The groundwater implementation plans in this document call for a number of measures (i.e., collection, treatment, storage or disposal facilities) which should result in improved groundwater quality along the U.S.- Mexico border such as the Bajo Rio Bravo/Lower Rio Grande (e.g., Matamoros/Brownsville area) planning efforts (USEPA 1992b).

#### 1.6.2.4 Groundwater Uses and Yields

Groundwater uses designated by the TNRCC and projected groundwater yields for the year 2000 in the aquifer and associated surface water basin are listed in Table 16 (Texas Department of Water Resources 1984; TWC 1992a).

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Table 15 - Groundwater Quality Problem Areas within the Aquifer/Surface Water Basins of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Aquifer/ Surface Water Basins	Pollutants	Source of Pollutants	Counties
<b>GULF COAST</b>			
San Jacinto River	Radium and radon gas Wood presentation Pesticides	Uranium mineralization (Catahoula Formation) Silvicultural activities Agricultural activities	Harris
San Jacinto-Brazos Coastal	Mineral/fossil fuel recovery	Abandoned oil rig supply wells	Galveston
Brazos-Colorado Coastal	Sulfur	Mining activities	Wharton
Colorado River	Nitrogen, phosphates, salts and infectious agents	Feedlots/animal wastes	Wharton
Lavaca River	Mineral/fossil fuel recovery Radium	Abandoned oil rig supply well Outcrop of uranium-bearing strata	Jackson Victoria
Guadalupe River	Mineral/fossil fuel recovery	Abandoned oil rig supply wells	Victoria
San Antonio-Nueces Coastal	Pesticides	Agricultural activities	Refugio
Nueces River	Nitrogen, phosphates, salts, and infectious agents Scale or corrosive inhibitans Suspended solids, nitrates, chlorides, sulfates, sodium, calcium, and fecal coliform	Feedlots/animal wastes  Air conditioning return flow wells Sewage disposal wells (septic systems)	San Patricio  San Patricio, Nueces Nueces
Nueces-Rio Grande Coastal	Uranium Nitrogen, phosphates, salts, and infectious agents	Mining activities Feedlots/animal wastes	Kleberg
Rio Grande	Pesticides and arsenic Nitrogen, phosphates, salts, and infectious agents	Agricultural activities Feedlots/animal wastes	Cameron, Willacy Cameron

Source: TWC 1989, 1992a

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Table 16 - Groundwater Yields and Uses within the Aquifer/Surface Water Basins of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Aquifer/ Surface Water Basins	Counties	<u>Yields (thousands acre feet/year) and Uses</u>					
		Municipal	Manufacturing	Steam-Electric Power Generation	Mining	Irrigation	Livestock
GULF COAST							
Sabine River	Orange	17.4	14.5	—	—	—	1.2
Neches River	Orange, Jefferson	36.1	15.1	2.0	0.1	5.4	0.7
Neches-Trinity Coastal	Jefferson, Chambers	2.9	1.2	—	1.2	—	0.2
Trinity	Chambers	9.6	0.3	—	0.1	13.0	0.1
Trinity-San Jacinto Coastal	Chambers	4.4	2.0	0.2	0.1	4.3	—
San Jacinto	Harris	214.4	28.8	16.9	5.6	39.4	0.4
San Jacinto-Brazos Coastal	Galveston, Brazoria	82.5	—	2.0	1.1	6.3	0.5
Brazos River	Brazoria, Fort Bend	18.8	0.2	11.0	4.4	45.8	0.7
Brazos-Colorado Coastal	Brazoria, Matagorda, Wharton	19.3	4.6	—	4.9	36.4	0.3
Colorado River	Matagorda, Wharton	32.6	3.7	—	0.3	17.8	6.9
Colorado/Lavaca Coastal	Matagorda	2.6	0.2	—	0.3	5.3	0.1
Lavaca River	Jackson	10.6	1.2	—	2.3	52.6	1.3
Lavaca-Guadalupe Coastal	Calhoun, Victoria	6.3	—	—	1.0	30.0	0.2

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Table 16 - Groundwater Yields and Uses within the Aquifer/Surface Water Basins of the Gulf Coastal Plains Province (Continued)  
(Texas Gulf Coast)

Aquifer/ Surface Water Basins	Counties	Municipal	Manufacturing	Steam-Electric Power Generation	Mining	Irrigation	Livestock
GULF COAST (Continued)							
Guadalupe River	Victoria	14.3	1.4	2.0	0.2	1.3	2.8
San Antonio River	Refugio	16.0	0.4	—	0.6	4.7	0.5
San Antonio-Nueces Coastal	Refugio, San Patricio	6.6	—	—	1.0	4.2	0.4
Nueces River	San Patricio, Nueces	47.7	2.4	11.5	6.7	144.9	6.9
Nueces-Rio Grande Coastal	Nueces, Kleberg, Cameron	29.3	2.6	—	2.4	11.7	1.9
Rio Grande	Cameron	<u>37.4</u>	<u>0.2</u>	<u>2.1</u>	<u>20.5</u>	<u>117.9</u>	<u>10.1</u>
Totals		608.8	78.8	47.7	52.8	541.0	35.2

Source: Texas Department of Water Resources 1984; TWC 1992a

## 1.7 Noise

Noise is one of the major concerns associated with construction-related and military operational activities. The three common classifications of noise are: (1) general audible noise that is heard by humans; (2) special noise, such as sonic booms and artillery blasts that can have a sound pressure of shock component; and (3) noise-induced vibration also typically caused by sonic booms and artillery blasts involving noise levels that can cause physical movement (i.e., vibration) and even possible damage to natural and man-made structures such as geologic faults, buildings, and cultural resource structures. Most noise sources will fall within the audible noise classification because of the rural nature of the majority of the study area.

Audible noise typically is measured in A-weighted sound levels expressed in decibels (dBA). The A-scale de-emphasizes the low- and high-frequency portions of the sound spectrum and provides a good approximation of the response of the average human ear. On the A-scale, zero dBA represents the average least perceptible sound (gentle breathing) and 140 dBA represents the intensity at which the eardrum may rupture (jet engine at open throttle) (National Research Council 1977).

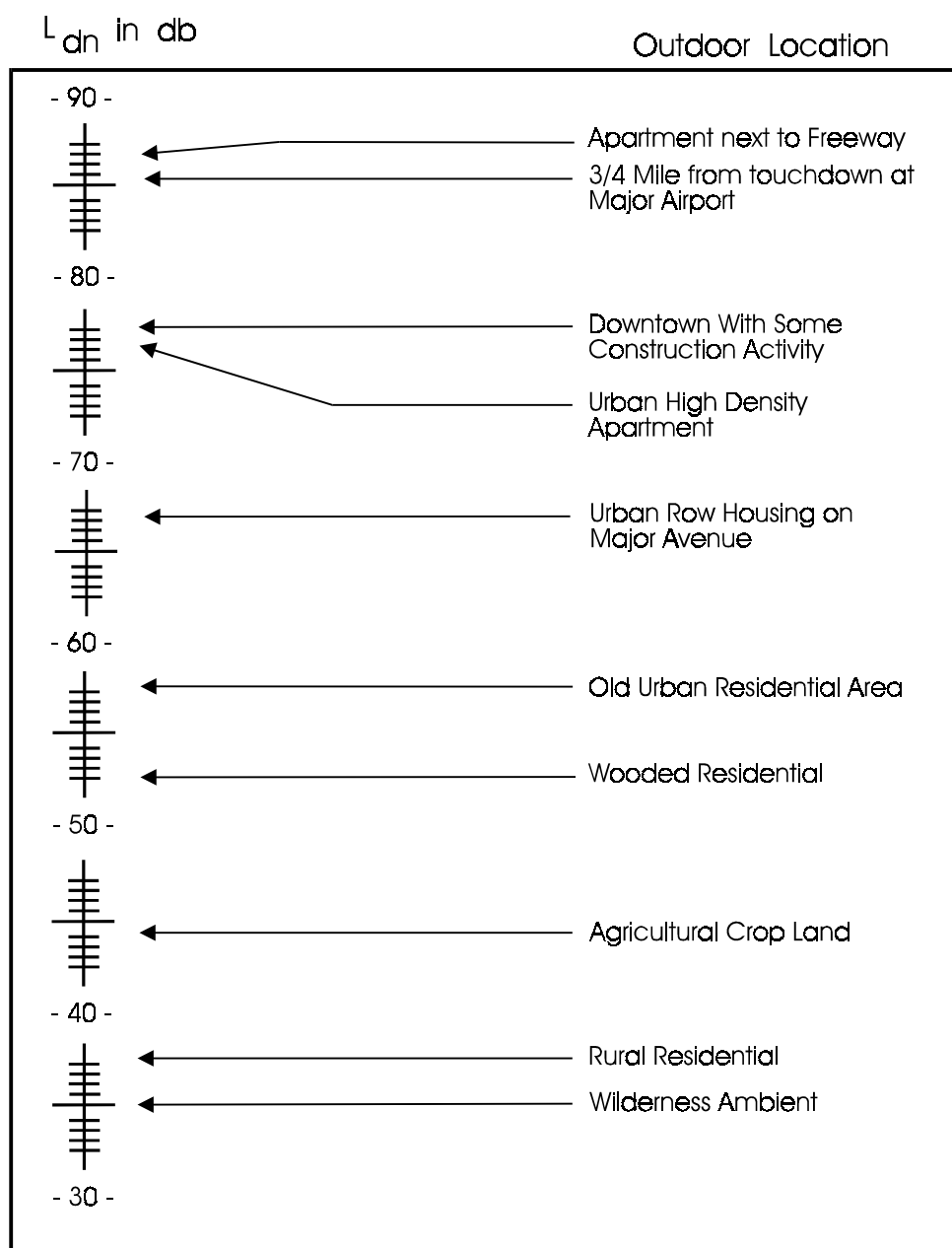
Since the proposed activities primarily involve construction-related and operational activities that are not capable of attaining the speed of sound and thus are incapable of causing special noises, all noise levels discussed herein will be measured on the A-scale (dBA). Based on Figure 10 and Table 17, normal rural noise levels in the study area would range from a low of 35 decibels (dB) over the majority of the corridor to a high of less than 60 dB near any rural community. Noise levels would increase in proximity to Houston and other urban communities (i.e., Port Arthur, Beaumont, Corpus Christi, Brownsville) due to vehicular traffic, commercial airlines, and major construction activities. Noise levels in these areas could range above 90 dB (Wyle Research Corporation 1992).

## 1.8 Land Use

### 1.8.1 Land Use Classification

Major land uses within the Texas Gulf Coast include urban, agriculture, rangeland, forest, recreation/special use, and water. Counties with extensive government (i.e., National Park Service, U.S. Forest Service, Bureau of Land Management) land are discussed in the section describing county land use. Specific land uses in each classification are described below.

- Urban - Specific land uses within this classification include residential (single family and multi-family), industrial, transportation, commercial, educational, medical, recreational, open space for environmental protection (i.e., floodway, utility easements, and right-of-way), and underdeveloped land within political boundaries (i.e., cities, towns, villages, etc.).
- Agriculture - Specific land uses within this classification would include highly developed croplands, pasture, small grains, forage crops, hay production, and orchards. The land may be irrigated or non-irrigated. Prime farmland may or may not be included depending on its existing and historical land use.
- Rangeland - Specific land use includes the grazing of cattle, horses, sheep, goats, and other domestic animals. This is based on the presence of naturally occurring grasses, grasslike plants and forbs, or shrubs suitable for grazing and browsing. This classification would include natural grasslands, savannas, some wetlands, and other areas with the potential to support certain forb and shrub communities under prudent and normally accepted land management practices.
- Forest - This land use classification is comprised of coniferous and deciduous stands of vegetation. The forest may or may not be suitable for the commercial harvest of timber. Tree canopy cover would usually be over 50 percent.



Source: Wyle Research Corp. 1992

Figure 10. Typical Average Day-Night Noise Levels for Various Outdoor Environments

Table 17 - Sound Levels (dB) and Relative Loudness of Typical Noise Sources in Indoor and Outdoor Environments

Table 17. Sound Levels (dB) and Relative Loudness of Typical Noise Sources in Indoor and Outdoor Environments				
dB(A)	Overall Level	Community Noise Levels (Outdoor)	Home and Industry Noise Levels (Indoor)	Subjective Loudness (Relative to 70 dB)
120	Uncomfortably loud	Military jet aircraft take-off with afterburner from aircraft carrier at 50 ft (130)	Oxygen torch (121)	32 times as loud
110		Turbo-fan aircraft at takeoff power at 200 ft (118)	Riveting machine (110) Rock band (108-114)	16 times as loud
100	Very loud	Jet flyover at 1000 ft (103) Boeing 707 DC-8 at 6080 ft before landing (106) Bell J-2A helicopter at 100 ft (100)		8 times as loud
90		Power mower (96) Boeing 737 DC-9 at 6080 ft before landing (97) Motorcycle at 25 ft (90)	Newspaper press (97)	4 times as loud
80		Car wash at 20 ft (89) Prop plane flyover at 1000 ft (88) Diesel truck 40 mph at 50 ft Diesel train 45 mph at 100 ft (83)	Food blender (88) Milling machine (85) Garbage disposal (80)	2 times as loud
70		Moderately loud	High urban ambient sound (80) Passenger car 65 mph at 25 ft (77) Freeway at 50 ft from pavement edge 10 a.m. (76)	Living room music (76) TV-audio, vacuum cleaner (70)
60		Air conditioning unit at 100 ft (60)	Cash register at 10 ft (65-70) Electric typewriter at 10 ft (64) Dishwasher (Rinse) at 10 ft (60) Conversation (60)	1/2 as loud
50	Quiet	Large transformers at 100 ft (50)		1/4 as loud
40		Bird calls (44) Lowest limit of urban ambient sound (40)		
dB Scale Interrupted				
10	Just audible			
0	Threshold of Hearing			
Legend:	dB = decibels		a.m.= ante meridiem (before noon)	
	dB(A) = decibels on the A-weighted scale			
	ft = feet			
	mph = miles per hour			
Source:	Wyle Research Corporation 1992			

- Recreation/Special Use - This land use classification includes barren land, or land with sparse vegetation cover during a major portion of the year. Areas of sand dunes or shifting soil would also be included within this classification. This classification also includes tourist recreation and natural and wildlife management areas.
- Water - This land use classification includes naturally occurring and made-made lakes, reservoirs, gulfs, bays, rivers, streams, and coastal wetlands.

### 1.8.2 Existing Land Use

The existing land and water area of each county (U.S. Department of Agriculture 1992), as of 1987, is listed in Table 18. The land areas (Table 19) given for each county are the official land and water areas as listed in the Soil Conservation Service (SCS) State Manual 1560.3 and may differ from other published sources. Land uses range from well developed urban centers of commerce (i.e., Beaumont, Port Arthur, Houston, Galveston, Corpus Christi, and Brownsville) to areas of intensive agricultural activities (i.e., Brazoria, Wharton, and Matagorda counties) to extensive areas of intensive recreation and wildlife management activities (e.g., Padre Island National Seashore, Aransas and Laguna Atascosa National Wildlife Areas).

Table 18 - Land and Water Areas by County in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Coast/ Counties	Land Area (acres)	Percent of County Land	Water Area (acres)	Percent of County Land
<b>UPPER COAST</b>				
Orange	229,760	95	10,880	5
Jefferson	608,640	95	35,200	5
Chambers	394,240	70	165,760	30
Harris	1,102,200	98	27,400	2
Galveston	255,360	60	169,600	40
Fort Bend	556,160	99	6,400	1
Brazoria	910,720	95	51,200	5
Wharton	688,640	99	5,120	1
Matagorda	740,480	82	167,040	18
Jackson	544,000	98	8,960	2
<b>CENTRAL COAST</b>				
Victoria	566,880	100	1,280	0
Calhoun	336,644	58	247,036	42
Refugio	495,488	96	22,912	4
Aransas	176,000	61	114,560	39
San Patricio	438,400	98	9,600	2
Nueces	538,240	77	158,080	23
Kleberg	544,640	84	103,040	16
<b>LOWER COAST</b>				
Kenedy	892,160	78	249,600	22
Willacy	378,240	80	94,080	20
Cameron	<u>616,695</u>	83	<u>125,065</u>	17
Totals	11,013,587		1,772,813	

Source: U.S. Department of Agriculture 1992

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Table 19- Existing Land Use by County in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Coast/ Counties	Land Use Classifications (in thousands of acres*)						Total**
	Agriculture	Rangeland	Forest	Recreation/ Special Use	Urban	Water	
UPPER COAST							
Orange	57.6	31.7	71.8	10.0	51.9	4.9	230.9
Jefferson	217.1	155.5	52.6	5.4	108.7	10.9	550.2
Chambers	273.6	34.6	2.6	1.9	30.3	4.3	347.3
Harris	190.5	80.6	128.6	31.7	644.5	6.6	1082.5
Galveston	61.0	79.8	--	7.1	100.8	3.8	252.5
Fort Bend	392.4	68.6	4.2	6.6	78.1	8.8	558.7
Brazoria	595.4	117.0	--	8.6	123.0	23.7	867.7
Wharton	656.4	--	--	4.4	22.3	12.3	695.4
Matagorda	560.1	101.8	--	4.7	40.5	7.8	714.9
Jackson	366.3	137.2	--	2.2	12.2	4.9	522.8
CENTRAL COAST							
Victoria	182.5	330.5	--	1.8	39.9	2.1	566.8
Calhoun	177.0	124.0	--	3.1	19.3	1.2	324.6
Refugio	72.3	412.0	--	0.9	6.3	1.2	492.7
Aransas	0.5	63.0	--	34.6	26.1	1.1	125.3
San Patricio	51.3	129.1	--	23.2	37.2	2.8	443.6
Nueces	384.1	43.5	--	26.3	83.1	0.8	537.8
Kleberg	120.3	348.2	--	26.8	14.1	1.3	510.7
LOWER COAST							
Kenedy	5.8	651.7	--	148.7	4.2	2.7	813.1
Willacy	283.1	90.3	--	25.3	9.8	1.8	410.3
Cameron	<u>319.9</u>	<u>159.3</u>	<u>--</u>	<u>50.4</u>	<u>59.9</u>	<u>4.5</u>	<u>594.0</u>
Totals	4,967.2	3,158.4	262.8	423.7	1,512.2	107.5	10,641.8
Percentage (%)	46.7%	29.7%	2.5%	3.98%	14.2%	1.0%	

\*Federal land area not included

\*\* Area rounded

Source: U.S. Department of Agriculture 1992

The majority of land use in the Texas Gulf Coast is agriculture (46.7 percent), followed by rangeland (29.7 percent), urban (14.2 percent), recreation/special use (four percent), forest (three percent), and water (one percent). Agriculture and rangeland combined totaled 77 percent of the total land use within the study area.

A brief description of existing land uses by county is discussed below (Kingston 1993). Large areas of land used for special purposes (e.g., recreation) or with special ownership (e.g., Native Americans) are discussed within the county description.

### 1.8.3 Land Use by County

- Orange County - The major land use classification is forest (33 percent), agriculture (25 percent), and rangeland (14 percent). The county is made up of approximately 22 percent urban land. Major urban areas are Orange (county seat, population 18,953), Bridge City (population 8,229), and Vidor (population 711,021) according to the 1996 census estimates. The county is bordered on three sides by water: (1) the Sabine River, (2) the Neches River, and (3) Sabine Lake.
- Jefferson County - The major land uses are forest (10 percent), agriculture (39 percent), and rangeland (28 percent). Urban areas represent 20 percent of the land use. Major urban centers are Beaumont (county seat, population 111,224), Port Arthur (population 57,701), Groves (population 16,728), Nederland (population 16,867), and Port Neches (population 13,321). The county is highly industrialized with oil refineries, chemical plants, shipping facilities, and related manufacturing facilities located in the urban areas.
- Chambers County - The western border of this county is located east of Galveston Bay. The principal city and county seat is Anahuac (population 2,043). The major land use is agriculture (79 percent). Urban land use accounts for nine percent of land use. Other urban areas include Baytown (population 68,156), Mont Belvieu (population 1,691), and Winnie (population 2,238). The county is rural in character and has limited manufacturing and commercial activities.

Harris County - This county is the most urbanized county along the Texas Gulf Coast and in the State of Texas. Urban land use is 60 percent of the total. The major center of commerce is Houston (population 1,744,058). Other large cities include Pasadena (population 131,620), Bellaire (population 14,998), Channelview (population 25,564), La Porte (population 31,949), and Deer Park (population 30,220). Minor land uses include agriculture (18 percent), forest (12 percent), and rangeland (seven percent). The county is bisected by many bayous, lakes, and canals. The county is also highly industrialized with more than 3,500 manufacturing plants. The county has the nation's largest concentration of petrochemical plants and is a wheat-exporting port. Agricultural activities include beef production and dairy operations. Crops produced include rice, corn, peanuts, and nursery plants.

- Galveston County - This historic island county is a center for tourism and outdoor recreation on this section of the Gulf Coast. Urban land comprises 40 percent of the total land use with agriculture and rangeland comprising the remaining 60 percent. Major agriculture activities include the production of rice, soybean, sorghum, and corn along with an increasing aquaculture sector. Limited industrial activities include the production of oil, gas, clays, sand, and gravel. Port activities and petrochemical plants are the dominant industrial land use. Major urban areas include Galveston (county seat, population 60,048), Texas City (population 42,368), Friendswood (population 28,218), and League City (population 40,631).
- Fort Bend - The major land use is agriculture (70 percent). Rangeland and forest combined total 13 percent. Urban land use accounts for 14 percent of the total land use. Urban centers include the county seat of Richmond (population 13,231), Mission Bend (population 14,195), and minor parts of the cities of Houston and Sugarland. Agricultural products include rice, cotton, sorghum, soybeans, corn, and vegetables.
- Brazoria County - The major land use is agriculture (69 percent) with urban land use as second (14 percent). Agricultural activities include the production of rice and sorghum, along with aquaculture,

beef production, and the raising of horses. The county has an extensive petroleum and chemical industry located within the urban areas and along the numerous bayous. The City of Angleton (population 20,200) is the county seat and the largest city in the county. Other cities include Clute (population 9,770), Freeport (population 11,680), and Lake Jackson (population 25,774).

- Wharton County - The major land use is agriculture (94 percent). The only other significant land use is urban (three percent). Wharton is the leading Texas county for rice production. Other agricultural crops include sorghum, cotton, and corn. Cow-calf production and poultry are also present. Urban areas include Wharton (county seat, population 9,308) and El Campo (population 10,654).
- Matagorda County - The major land use is agriculture (78 percent). Rangeland ranks second (14 percent) and urban land use is (five percent). Agricultural crops include rice, cotton, and grains. Beef cattle production is also predominant. Urban areas contain petrochemical plants and a variety of manufacturing facilities. The urban centers include Bay City (county seat, population 18,705) and Palcios (population 4,455).
- Jackson County - The major land use is agriculture (70 percent). Rangeland ranks second with 26 percent of the land use area. Major agricultural crops include rice, corn, grain, sorghum, and cotton. Beef cattle production is also present. Urban areas comprise two percent of the total. The county seat and largest urban center is Edna (population 6,081).
- Victoria County - Rangeland comprises 58 percent of the county's total land area. Rangeland is used primarily for beef and dairy cattle pastureland. The second largest land use is agriculture which constitutes 32 percent of the total land area. Important crops include grain, sorghum, cotton, corn, rice, and soybeans. Urban land uses are contained primarily within the county seat, Victoria (population 61,059). Commercial activity is generated by the oil industry, manufacturing, agribusiness, and tourism. Tourist activity includes hunting, fishing, and various saltwater related activities.
- Calhoun County - The two major land uses are agriculture and rangeland, 55 and 38 percent, respectively. Urban land use is six percent of the total land use area. Agricultural crops include rice, cotton, grains, sorghum, and limited rice production. The production of beef is a significant use of rangeland. Urban areas include the county seat of Port Lavaca (population 11,946), Port O'Connor (population 1,184 estimated), and Port Comfort (population 956).
- Refugio County - The major land use is rangeland (84 percent). Agriculture is ranked second with 15 percent of the total land use. Urban areas are about one percent of the land use area. Agricultural activities include grain, sorghum, corn, and cotton. Beef production and the leasing of land for hunting are other income generators within the county. The largest urban center and county seat is Refugio (population 3,132).
- Aransas County - The major land use is rangeland (50 percent). The second largest land use is recreation/special land use (28 percent) and includes lands used for recreation such as the Aransas National Wildlife Refuge on Matagorda Island. Urban land use (21 percent) is oriented to tourist and fishing activities. The major urban center is Rockport (county seat, population 6,463).
- San Patricio County - The major land use is agriculture (57 percent) with rangeland second (29 percent). Urban land use occupies eight percent of the land. The major urban centers include Aransas Pass (population 7,893) and Sinton (county seat, population 6,827). The major industries include fishing, tourism, and services for off-shore drilling activities.
- Nueces County - The major land use is agriculture (71 percent). Urban land use accounts for 15 percent of the county land use. The area is a major resort area for fishing and water related sports. Agricultural crops include sorghum, cotton, corn, and wheat.

- Kleberg County - The major land uses are rangeland (68 percent) and agriculture (26 percent). A large portion of the well-known King Ranch is located in the eastern portion of the county and occupies approximately 50 percent of the county land area. Urban land use (three percent) is concentrated in the county seat of Kingsville (population 25,375).
- Kenedy County - The major land use is rangeland (80 percent). Recreation/special land use (18 percent) consists mostly of areas for hunting and fishing along with cattle and horse production. Hunting leases are the major industry of the county. The county lacks well-defined urban centers. The county seat is Sarita with an estimated population of 185.
- Willacy County - The major land use is agriculture (69 percent) followed by rangeland (22 percent). The major urban city and county seat is Raymondville (population 9,639). Agricultural lands are used for the production of cotton, sorghum, sugar cane, corn, and vegetables with limited cattle, hog, and horse production. Land used for recreation and tourism totals six percent of the land. Recreation activities include fresh and saltwater fishing, hunting, and other attractions for winter tourists.
- Cameron County - The major land use is agriculture (54 percent), followed by rangeland (27 percent). Land use for recreational activities is 10 percent including land used for fishing, hunting, water sports, and other related year-round tourist activities. Numerous historic and wildlife areas also occur in the county. Major urban centers include Brownsville (county seat, population 132,091), Harlingen (population 56,893), and San Benito (population 23,047).

#### 1.8.4 Recreation/Special Land Use Areas

The Texas Gulf Coast contains numerous recreation/special land use areas. These land uses vary from national and state parks to wildlife management refuge areas. The majority of these special land use areas are outside of highly urbanized centers. Table 20 lists the recreation/special land use areas within the study area along the Gulf Coastal Plains Province. These lands have been established for various recreational activities but are also for flood control, scenic, historic, and wildlife management uses. The natural areas are highly valued for their aesthetics, qualities and minimum urban development. The major percentage of the land outside of the urban centers is in private ownership. The two government agencies owning large acreages of land within the study area are the Texas Department of Parks and Wildlife (State Parks and Wildlife Management Areas) and the U.S. Department of the Interior, National Park Service (National Parks and Historic Sites) and U.S. Fish and Wildlife Service (National Wildlife Refuges). Numerous areas (86) of the Lower Rio Grande Valley National Wildlife Refuge will encompass some 107,500 acres within the four county area of Cameron, Willacy, Hidalgo, and Starr counties. Thirty-six of these areas located in Willacy and Cameron counties are listed in Table 21.

#### 1.8.5 Coastal Barriers

Coastal barriers consist of offshore ridges such as bars, beaches, islands, spits, peninsulas, and other land forms found all along the Texas Gulf Coast including adjacent wetlands, marshes, estuaries, inlets, and nearshore waters. The Coastal Barrier Resources Act of 1982 established the Coastal Barrier Resources System which grouped identified barriers into mapped units and prohibited federal expenditures and financial assistance for development within the System. Coastal barriers serve a variety of functions including protection of the mainland from storm waves and surges, buffering of wave energy to allow formation of marshes and estuaries, various wildlife habitats, and recreation. Tables 22 and 23 list the acreage of the various barrier units proposed additions to the Coastal Barrier Resource System within the study area (Jenkins 1989).

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Table 20 - Recreation/Special Land Use Areas along the Upper, Central, and Lower Coasts of the Gulf Coastal Plains  
Province  
(Texas Gulf Coast)

County	Area	Acreage(acres)	Ownership
ORANGE	Unit 616 Type II WMA	30,579 <sup>a</sup>	TPWD
	Unit 129 Type II WMA	4,134	TPWD
	Big Thicket National Preserve	86,000 <sup>b</sup>	NPS
	- Beaumont Unit	6,128	
	Lower Neches WMA	6,200	TPWD
	Sydnese Island Wildlife Sanctuary	126	National Audubon Society
JEFFERSON	Big Thicket National Preserve	86,000 <sup>b</sup>	NPS
	- Little Pine Island Bayou Corridor Unit		
	Davis Hill Site State Park	1,735	TPWD
	Wilson Preserve	43	TNC
	J.D. Murphree WMA	13,366	TPWD
	- Lost Lake	4,200	
	Sea Rim State Park	4,145	TPWD
	Sabine Pass Battleground SHP	58	TPWD
	Texas Point NWR	8,952	USFWS
	McFaddin NWR	56,179	USFWS
CHAMBERS	Anahuac NWR	34,296	USFWS
	- Jackson Tract	576	
	- Barrow Ranch	12,670	
	Moody NWR	3,517	USFWS
	Candy Abshier WMA	207	USFWS
	Vingt-et-un Islands	68	National Audubon Society
HARRIS	Hookwood (Conservation Easement)	102	PVT/TNC
	Jesse H. Jones Nature Center	225	Harris County
	Lake Houston State Park	4,920 <sup>c</sup>	TPWD
	Sheldon State Park	2,503	TPWD
	Armand Bayou Nature Center	1,900	Harris County
	- Mares' Woods	8	PVT
	Edith Moore Nature Sanctuary	17	Houston Audubon Society
	San Jacinto Battleground SHP and Battleship Texas SHS	1,121	TPWD
	Atkinson Island	152	TPWD
	Lyndon B. Johnson Space Center	123	NASA
GALVESTON	High Island	24	Houston Audubon Society
	- Boy Scout (Louis Smith) Woods	11	
	- Smith Oaks Sanctuary	13	
	Bolivar Flats Shorebird Sanctuary	550	Houston Audubon Society/GLO
	North Deer Island and West Bay Bird Island	200	National Audubon Society
	Pierce Marsh	1,361	TNC
	Galveston Island State Park	2,013	TPWD

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Table 20 - Recreation/Special Land Use Areas along the Upper, Central, and Lower Coasts of the Gulf Coastal Plains  
Province (continued)  
(Texas Gulf Coast)

County	Area	Acreage(acres)	Ownership
FORT BEND	Brazos Bend State Park	4,897	TPWD
	Brazoria County Access Point	17	Brazoria County
BRAZORIA	Christmas Bay State Park	485	TPWD
	Drum Bay	211	CTC
	Brazoria NWR	43,905	USFWS
	- Slop Bowl Marsh	1,905	USFWS/TNC
	- Hoskins Mound	28,654	USFWS
	- Christmas Point*	175	USFWS
	Jackson Plantation	53	City of Lake Jackson
	Bryan Beach State Park	878	TPWD
	Bryan Lake	149	TPWD
	Peach Point Marsh WMA	10,311	TPWD
	San Bernard NWR	28,000 <sup>d</sup>	USFWS
	Varner-Hogg SHP	66	TPWD
MATAGORDA	San Bernard NWR	28,000 <sup>d</sup>	USFWS
	- Smith Marsh	2,375	
	Big Boggy NWR	4,526	USFWS
	- Dressing Point Island	29	
	Mad Island WMA	7,281	TPWD
	- Clive Runnels Preserve	7,048	TNC/DU
	Matagorda Peninsula State Park	6,322	TPWD/GLO
JACKSON	Mustang Recreation Area	250	USBR
	Lake Texana State Park	575	TPWD
	Brackenridge Plantation Recreation Area	250	USBR
CALHOUN	Port Lavaca State Fishing Pier	11	TPWD
	Guadalupe Delta WMA	5,448	TPWD
	- Alligator Slide	633	TNC
	Welder Flats Coastal Preserve	1,480	TPWD
	Whitmire/Rancho La Bahia	2,956	USFWS
	Matagorda Island State Park and WMA	43,900	TPWD/USFWS
	- Matagorda Island Wildlife Sanctuary	3,638	National Audubon Society
	Aransas NWR	114,397 <sup>e</sup>	USFWS
	- Matagorda Island	11,502	
REFUGIO	Aransas NWR (small portion south of Austwell)	114,397 <sup>e</sup>	USFWS
	Fennessey Ranch	4,000	PVT
ARANSAS	Aransas NWR	114,397 <sup>e</sup>	USFWS
	- Lamar Peninsula	734	TNC/USFWS
	Copano Bay State Fishing Pier	6	TPWD
	Fulton Mansion SHS	2	TPWD

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Table 20 - Recreation/Special Land Use Areas along the Upper, Central, and Lower Coasts of the Gulf Coastal Plains  
Province (continued)  
(Texas Gulf Coast)

County	Area	Acreage(acres)	Ownership
ARANSAS (continued)	Goose Island State Park	321	TPWD
	Robert Porter Allen Sanctuary	1,000	National Audubon Society
	Connie Hagar Wildlife Sanctuary	—	TPWD
SAN PATRICIO	Lake Corpus Christi State Park	288 <sup>f</sup>	TPWD
	Welder Wildlife Refuge	7,800	Welder Foundation
	Indian Point Wetlands	57	City of Portland
	Ingleside Wildlife Sanctuary	—	TPWD
NUECES	Mustang Island State Park	3,954	TPWD
	Hans Sutter Wildlife Refuge	22	PVT
	Fred Jones Nature Sanctuary	—	PVT
	Redhead Pond	42	TNC/TPWD/DU
	Lipantitlan SHP	5	TPWD
	Ingleside Naval Station	—	USN
	Corpus Christi NAS	180	USN
	Corpus Christi Botanical Gardens	264	Corpus Christi Botanical Society
KLEBERG	South Bird Island Wildlife Sanctuary	100	National Audubon Society
	Padre Island National Seashore	133,918 <sup>g</sup>	NPS
	King Ranch	825,000	PVT
	Kingsville NAS	—	USN
	Drum Point Seashore and Kaufer-Hubert Memorial County Park	100	Kleberg County
	Santa Gertrudis Creek Bird Sanctuary	—	PVT
	Louise Trent Bird Sanctuary	—	Audubon Outdoor Club of Corpus Christi
KENEDY	Padre Island National Seashore	133,918 <sup>g</sup>	NPS
WILLACY	Padre Island National Seashore	133,918 <sup>g</sup>	NPS
	Lower Rio Grande Valley NWR	64,374 <sup>h</sup>	USFWS
	- Beasley Jarret	333	
	Las Palomis WMA	35	TPWD
	- Frederick Unit	35	
	Laguna Atascosa NWR*	45,187 <sup>i</sup>	USFWS
CAMERON	Green Island Wildlife Sanctuary	2,674	National Audubon Society
	Laguna Atascosa NWR*	45,187 <sup>i</sup>	USFWS
	- Bayside Resaca Area**	—	
	- Granjeno*	125	
	- South Texas Cordgrass Prairie*	50	

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Table 20 - Recreation/Special Land Use Areas along the Upper, Central, and Lower Coasts of the Gulf Coastal Plains  
Province (continued)  
(Texas Gulf Coast)

County	Area	Acreage(acres)	Ownership
CAMERON (Continued)	Las Palomas WMA	586 <sup>d</sup>	TPWD
	- Longoria Unit	200	
	- Voshell Unit	68	
	- Carricitos Unit	118	
	- Anacua Unit	200	
	- Tucker-DeShazo Unit	102	
	- Brasil Unit	75	
	Lower Rio Grande Valley NWR	64,374 <sup>h</sup>	USFWS
	- Cluiss Tract	30	
	- First City	1,161	
	- Tenneco	385	
	- Los Aballos	2,028	
	- Vista del Mar	1,673	
	South Padre Island		
	- Isla Blanca Park	250	Cameron County
	- Andy Bowie Park	225	Cameron County
	Port Isabel Lighthouse SHP	0.9	TPWD
	Queen Isabella State Fishing Pier	7	TPWD
	Brazos Island State Park	217	TPWD
	Boca Chica State Park	1,055	TPWD
	Palo Alto Battleground NHS	50	NPS
	Sabal Palm Woods	367	National Audubon Society
	Resaca de La Palma State Park	1,100	TPWD
	Arroyo Colorado SRA	687	TPWD

\* Research Natural Area

\*\* National Natural Landmark

Legend: TPWD = Texas Parks and Wildlife Department WMA = Wildlife Management Area  
USFWS = U.S. Fish and Wildlife Service NWR = National Wildlife Refuge  
NASA = National Aeronautics and Space Administration SHP = State Historical Park  
GLO = General Land Office SRA = State Recreation Area  
DU = Ducks Unlimited TNC = The Nature Conservancy  
USBR = U.S. Bureau of Reclamation CTC = Cradle of Texas Conservancy, Inc.  
PVT = Private NAS = Naval Air Station  
NPS = National Park Service USN = U.S. Navy  
SHS = State Historical Structure or Site NHS = National Historical Site

<sup>a</sup> Unit acreage includes area in Jasper and Orange counties

<sup>b</sup> Total acreage includes 12 separate units throughout East Texas

<sup>c</sup> Total acreage includes area in Harris and Montgomery counties

<sup>d</sup> Total acreage includes area in Brazoria and Matagorda counties

<sup>e</sup> Total acreage includes area in Calhoun, Refugio, and Aransas counties

<sup>f</sup> Total acreage includes area in San Patricio, Jim Wells, and Live Oak counties

<sup>g</sup> Total acreage includes area in Kleberg, Kenedy, and Willacy counties

<sup>h</sup> Total acreage includes area in Willacy, Cameron, Hidalgo, and Starr counties; please refer to Table 22 for listing of Lower Rio Grande Valley NWR areas in Willacy and Cameron counties

<sup>i</sup> Total acreage includes acreage in Willacy and Cameron counties

<sup>j</sup> Includes various units throughout Cameron county

Source: TPWD 1985, 1991, 1992a, 1992b, 1998; Shearer Publishing 1988; U.S. Department of the Interior 1989; Araujo et al. 1990; Cummings 1990; Graham 1992; Jones 1992; National Audubon Society 1992; Kingston 1993; TNC 1993, 1997; USFWS 1993a, 1997

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Table 21 - List of the Lower Rio Grande Valley National Wildlife Refuge Areas in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Willacy County	Cameron County
Teniente	Delta Lake Canal
Payne	Thompson Road
East Lake	Tiocano Lake
La Perlita	Resaca Fresnos
Willamar	Vaqueteria Banco
	Lantana
	Selva Verde
	Villitas Banco
	Rangerville
	Ranchito
	Clark Island
	Santa Maria
	Champion Bend
	Vista del Mar
	Caja Pinta Banco
	San Benito Settling Basin
	Noriega
	Villa Nueva
	Tulosa Ranch
	Loma Preserve
	Brazos Island
	La Gloria
	Resaca Viejo
	Culberon Banco
	Tahuachal Banco
	Las Palomas Banco
	Garza-Cavazos
	Brownsville
	Boscage
	Palmito Hill

Source: USFWS 1992a; USFWS 1997

Table 22 - Coastal Barrier Resources System along the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Unit Name	Shoreline Length (Miles)
Jefferson	High Island <sup>1</sup>	—
	Sea Rim	2.5
Chambers	High Island	11.6
Galveston	Bolivar Peninsula	6.0
	High Island <sup>1</sup>	—
Brazoria	Brazos River Complex	4.0
	Folletts Island	9.4
Matagorda	Matagorda Peninsula <sup>2</sup>	—
	Sargent Beach	4.5
Calhoun	Matagorda Peninsula	52.6
	San Jose Island Complex <sup>3</sup>	—
Aransas	San Jose Island Complex	32.9
Kleberg	North Padre Island	6.4
Willacy	South Padre Island <sup>4</sup>	—
Cameron	Boca Chica	5.3
	South Padre Island	<u>25.8</u>
	Total Shoreline Length (miles)	161.0

Note: <sup>1</sup> Shoreline length included in Chambers County mileage

<sup>2</sup> Shoreline length included in Calhoun County mileage

<sup>3</sup> Shoreline length included in Aransas County mileage

<sup>4</sup> Shoreline length included in Cameron County mileage

Source: Jenkins 1989

Table 23 - Proposed Additions to Coastal Barrier Resources System along the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Unit Name	Shoreline Length (Miles)
Chambers	High Island	11.6
Galveston	Bolivar Peninsula	3.6
	Swan Lake	2.1
Brazoria	Brazos River Complex	3.85
Matagorda	Matagorda Peninsula <sup>1</sup>	—
	Shell Beach	1.29
Calhoun	Matagorda Peninsula	3.02
	Coon Island Bay	3.52
	Blackberry Island	5.37
	Shoalwater Bay	10.63
	San Jose Island Complex <sup>2</sup>	—
Aransas	San Jose Island Complex	1.65
Nueces	San Jose Island Complex <sup>2</sup>	—
Kleberg	Baffin Bay	1.65
	Starvation Point	1.76
	Cayo Del Infiernillo	2.45
	Kleberg Point	1.42
Cameron	Boca Chica	<u>3.27</u>
	Total Shoreline Length (miles)	47.60

Note: <sup>1</sup> Shoreline length included in Calhoun County mileage.

<sup>2</sup> Shoreline length included in Aransas County mileage.

Source: Jenkins 1989; Texas General Land Office, 1999

Padre Island is the longest coastal barrier island in the world, extending 113 miles from Corpus Christi Pass (which once separated it from Mustang Island to the north) to Mansfield Channel (which separates it from South Padre Island to the south). Eighty miles of its length are under the protection of the National Park Service with the remaining portions (North Padre) belonging to the City of Corpus Christi and Nueces County. The inland side of the island is covered with coastal grasses, while the Gulf of Mexico side is a sandy beach backed by a coastal dune ridge held in place by salt tolerant vegetation. Beyond the grasslands marshy tidal flats extend from the island's east edge into Laguna Madre, a shallow, salty body of water covering an area of 609 square miles (Cummings 1990; Weise and White 1991).

## 1.9 Transportation

### 1.9.1 Roads

The highway system along the Texas Gulf Coast is well developed. Interstate 45 (aligned north to south) crosses through Harris County and terminates at the City of Galveston in Galveston County (Figure 11). A section of Interstate 10 (aligned east to west) passes through the study area (i.e., Orange, Jefferson, Chambers, and Harris counties). These two segments of interstate highway are vital regional links.

Other major highways through the area include U.S. Highways 90, 59, and 77 (Figure 11). Most major highways in this area parallel the Texas Gulf Coast at a distance between 12 and 45 miles. Highway 90 enters the state near Orange, Texas, and runs west to the City of Houston. Highway 90 is parallel to or congruent with Interstate 10 as it continues west to the City of San Antonio. Highway 59 runs west from Houston through Victoria and terminates in

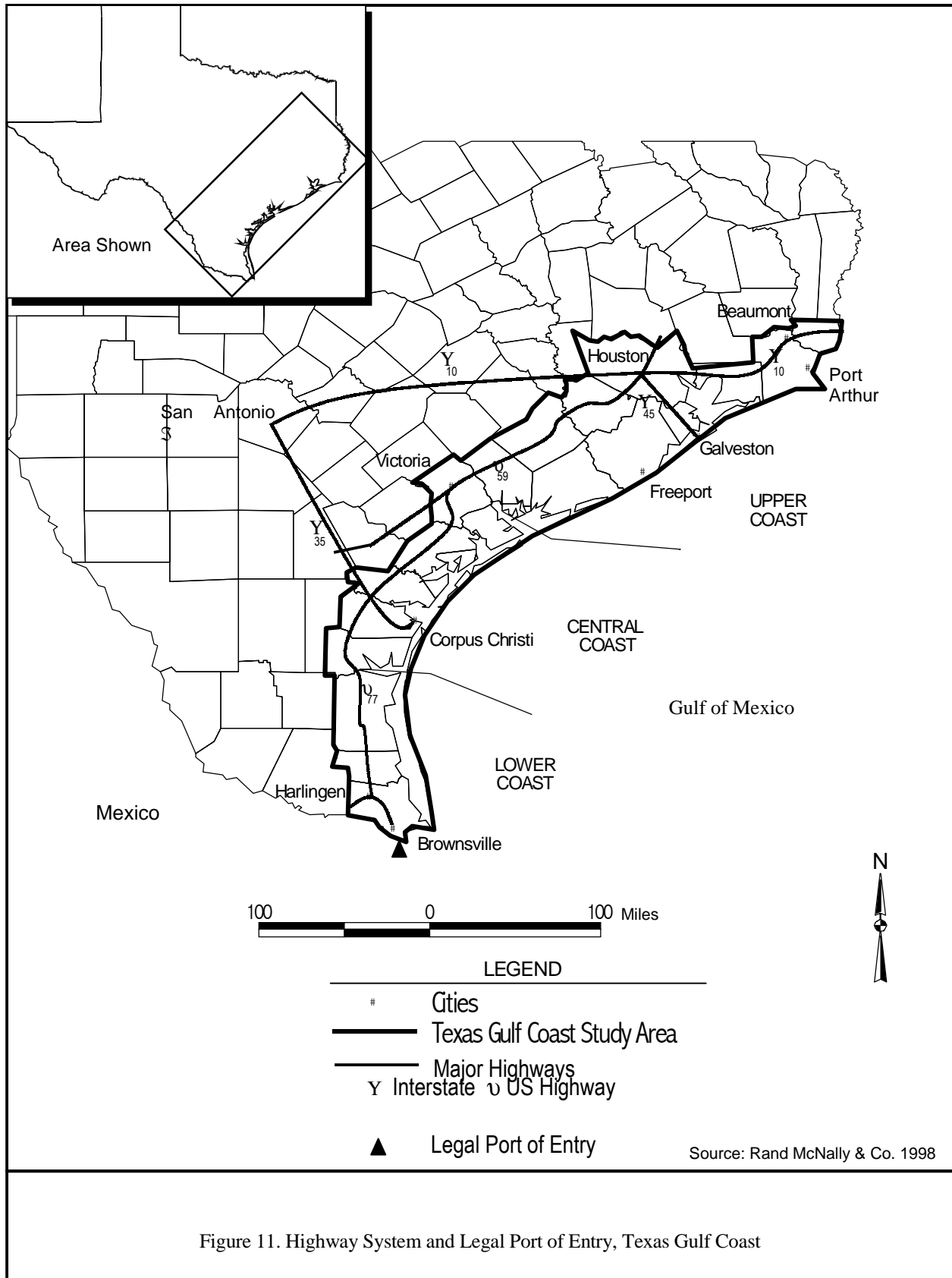


Figure 11. Highway System and Legal Port of Entry, Texas Gulf Coast

Laredo, Texas. Highway 77 is the principal highway connecting the cities of Victoria, Corpus Christi, Kingsville, Harlingen, and Brownsville. Numerous minor state highways and farm-to-market roads lead from the major highways to remote areas on the Texas Gulf Coast. Legal ports of entry within the study area are located in Cameron County at the Brownsville-Matamoros gateway and the B&M Bridge (National Archives and Records Administration, 1998).

#### 1.9.2 Railroads

There are six railroads within the study area. The total railroad mileage within the area is approximately 780 miles (Figure 12). Railroads operating within the study area include: (1) Missouri - Pacific, (2) Missouri - Kansas - Texas, (3) Atchison, Topeka and Santa Fe, (4) Southern Pacific, (5) Burlington Northern, and (6) Texas Mexican. The only passenger route (AMTRAK) is from Beaumont to Houston with passenger service operated by the National Railroad Passenger Corporation. In addition to AMTRAK, a Texas High Speed Rail Project has been proposed by the Texas TGV Corporation to connect the cities of Houston, Dallas/Fort Worth, and San Antonio. Only the northern portion of Harris County will be in the proposed study area. Railway legal port of entry within the study area is located at the Brownsville-Matamoros B&M bridge (GAO 1991a, 1991b; Morrison Knudson Corporation 1992; Rand McNally 1993).

#### 1.9.3 Airports

There are five airports in the area that have regularly scheduled commercial or commuter flights (Table 24). The data for aircraft departures include commercial and commuter flights; personal and business flights; instructional flights; aerial application flights for crop spraying, aerial photography, and other uses.

Approximately 25 small, commercial airports are also located within the Texas Gulf Coast (Table 25). These are small to medium airports which do not conduct regularly scheduled commercial or commuter flights. There are three major and three auxiliary military airfields in the study area as listed in Table 26. (U.S. Department of Commerce 1998a, 1998b, 1998c; Kingston 1993).

#### 1.9.4 Water

The Gulf Intracoastal Waterway is approximately 350 miles long, used by commercial shippers and fishing craft as well as recreational boaters, and is the connecting waterway for the drainage basins along the Texas Gulf Coast. These waterways within the study area are used quite extensively to transport bulk products within Texas and to other Gulf Coastal states. Table 29 gives the 1990 consolidated tonnage handled by the various ports and moving through the Gulf Intracoastal Waterway. Total tonnage in short tons (71,618,338) handled as through traffic in the three major sections of the Gulf Intracoastal Waterway is as follows: (1) Sabine River to Galveston - 45,593,288; (2) Galveston to Corpus Christi - 24,090,071; and (3) Corpus Christi to Mexico - 1,943,979 (Kingston 1993).

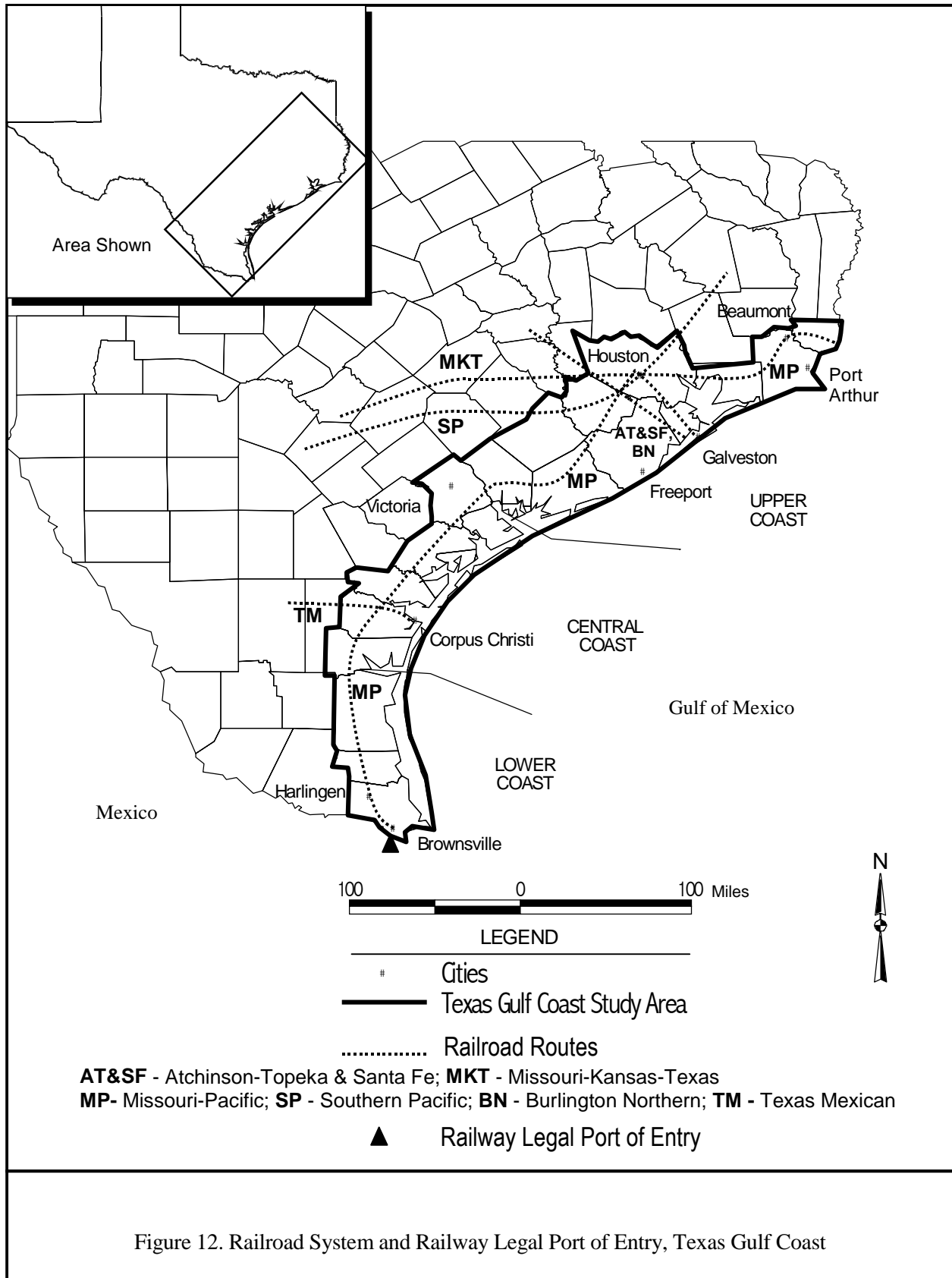


Figure 12. Railroad System and Railway Legal Port of Entry, Texas Gulf Coast

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Table 24 - Major Commercial Airports in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	City	Airport
Jefferson	Beaumont-Port Arthur	Beaumont
Harris	Houston	George W. Bush International  William P. Hobby
Nueces	Corpus Christi	Corpus Christi International
Cameron	Harlingen	Rio Grande Valley International

Source: U.S. Department of Commerce 1992a, 1992b, 1992c

Table 25 - Minor Commercial Airports in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	City	Airport
Orange	Orange	Orange County
Liberty	Liberty	Liberty County
Chambers	Anahuac	Chambers County
Chambers	Baytown	Baytown
Chambers	Baytown	Humphrey
Galveston	Galveston	Scholes
Galveston	Houston	Bay Electric
Galveston	Houston	Houston Gulf
Ft. Bend	Sugarland	Sugar Land/Hull
Ft. Bend	Houston	Andrau
Ft. Bend	Houston	Westheimer
Ft. Bend	Houston	Houston Southwest
Harris	Houston	Hooks Memorial
Brazoria	Houston	Clover
Brazoria	Brazoria	Brazoria County
Matagorda	Bay City	Bay City Municipal
Matagorda	Palacios	Palacios
Wharton	El Campo	Wharton County
Jackson	Grando	Jackson County
Victoria	Victoria	Victoria Regional
Calhoun	Port Lavaca	Calhoun County
Jim Wells	Alice	Alice International
Brooks	Falfurria	Brooks County
Aransas	Rockport	Aransas County
Aransas	Refugio	Rook
Cameron	Bay View	Port Isabel/Cameron County
Cameron	Brownsville	Brownsville/South Padre Island International
Hidalgo	McAllen	Miller International

Source: U.S. Department of Commerce 1998a, 1998b, 1998c

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Table 26 - Military Airfields in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	City	Airport
Harris	Houston	Ellington (National Aeronautics and Space Administration)
Nueces	Corpus Christi	Naval Air Station Corpus Christi
Nueces	Corpus Christi	Naval Outlying Landing Field Cabaniss
Nueces	Corpus Christi	Naval Outlying Landing Field Waldron
Jim Wells	Alfred	Naval Auxiliary Landing Field Orange Grove
Kleberg	Kingsville	Naval Air Station Kingsville

Source: U.S. Department of Commerce 1998a, 1998b, 1998c

Table 27 - Tonnage Handled by Texas Ports in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Port	1995 Tonnage <sup>1</sup>
Orange	693,000
Beaumont	20,937,000
Port Arthur	49,800,000
Sabine Pass	231,000
Cedar Bayou	473,000
Galveston	10,465,000
Texas City	50,403,000
Houston	135,231,000
Dickinson	657,000
Sweeny*	534,406
Chocolate Bayou	3,480,000
Johnsons Bayou	585,000
Freeport	19,662,000
Colorado River	576,000
Port Lavaca*	6,097,107
Channel to Victoria	4,624,000
Corpus Christi	70,218,000
Aransas Pass	181,000
Rockport*	643,563
Port Mansfield	20,000
Harlingen*	764,577
Port Isabel	129,000
Brownsville	2,656,000
Totals	379,060,653

<sup>1</sup>all tonnage is presented in short tons (2,000 pounds). Tonnage shown is for 1990, as 1995 tonnage not reported  
Source: Kingston 1993, Ramos, 1997

## 1.10 Hazardous Wastes

### 1.10.1 Overview

A review of regulatory database information from federal and state regulatory agencies was conducted to identify areas of known hazardous waste/substance releases, regulatory violations, or other documented incidents. This information provided by USEPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list, USEPA's Resource Conservation and Recovery Information System (RCRIS) violation and corrective action list, and the TNRCC leaking petroleum storage tank (LPST) database. In addition, the USEPA Toxic Release Inventory (TRI) provides gross data regarding reported releases not included in the other databases. These information databases report hazardous waste or substance sites which pose a potential risk to human health and the environment. This information was used to identify areas impacted by hazardous wastes or substances within the Texas Gulf Coast study area and to develop Figures 13 through 15 that show a general representation of the relative geographic concentrations of these sites and Table 28 that list the data.

CERCLIS registers potential hazardous substance sites identified under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 including sites that are reported on the National Priorities List (NPL or Superfund sites). CERCLA was enacted to respond to threats posed by uncontrolled releases of hazardous substances to the environment. The NPL includes those sites that appear to pose the most serious threats to human health and the environment, and are eligible for Superfund financed remedial action.

The RCRIS violation and corrective action list contains hazardous treatment, storage, and disposal (TSD) facilities regulated under the Resource Conservation and Recovery Act (RCRA) of 1976 that have reported violations and/or corrective actions. RCRA controls the generation, transportation, treatment, storage, and disposal of hazardous waste through comprehensive management techniques and requirements. Violations to this Act can include deviation from regulations or provisions of compliance orders, consent agreements, consent decrees, permit conditions or manifests. Corrective actions taken under RCRA can include groundwater or surface water monitoring, closure and post-closure activities at a facility, compliance studies, and remedial actions.

The State of Texas LPST database is a listing of storage tanks which have reported a release of petroleum to the environment. This listing was derived from the TNRCC files and includes only those sites reported to the State of Texas. These lists may include sites that have already been granted closure and does not include unreported sites or sites outside of major population centers.

### 1.10.2 Hazardous Waste Sites

Based on the summary data obtained, an overall total of 5,151 sites were identified in the Texas Gulf Coastal study area including: 148 CERCLIS sites, 150 RCRIS violation and corrective action sites, and 4,853 LPUST sites. Another potential source of pollution occurring in some regions of the border area is the transboundary movement of hazardous materials/wastes and abandoned, unpermitted, or illegal hazardous waste sites. Within the study area, the sister cities of Matamoros, Mexico and Brownsville, Texas are considered to be high priority locations where the transportation, handling, and disposal of hazardous wastes are a focus of regulatory and public concern.

As part of the 1989 Agreement efforts, an "Integrated Environmental Plan for the Mexican - U.S. Border Area (First Stage, 1992-1994) was completed recently (USEPA and SEDUE 1992). The hazardous waste implementation plans in this document call for a number of measures (i.e., tracking, surveillance and enforcement, transportation issues, and site identification) which should result in improved hazardous waste quality along the U.S.- Mexico border such as the Bajo Rio Bravo/Lower Rio Grande (e.g., Matamoros/Brownsville area) planning efforts (USEPA 1992b).

The Border XXI Program (Border XXI or Program) is an innovative binational effort which brings together the diverse U.S. and Mexican federal entities responsible for the shared border environment to work cooperatively toward sustainable development through protection of human health and the environment and proper management of natural resources in both countries. The *US-Mexico Border XXI Program Framework Document* (EPA 160-R-96-003), October 1996, states that the public is aware of inadequate solid waste disposal practices and perceives a

lack of landfills and other resources required for the proper operation of community garbage disposal programs. Area residents called for the reduction of hazardous and solid waste by industry and commercial facilities such as paint shops. Curbside recycling is seen as incomplete in Brownsville. Residents called for recycling efforts by small businesses such as automobile repair and paint shops. Brownsville residents are concerned about the possible impact of the burning of municipal waste in Mexican solid waste facilities within the binational airshed. Residents of the region expressed significant concern about the types, quantities and destinations of hazardous materials and wastes transported through their neighborhoods and city centers. Community and government concerns stem from the high number of crossings and the projections that commercial transportation across the international boundary will likely increase with the North American Free Trade Agreement (NAFTA).

In some urban areas, on both sides of the border, there is inadequate capacity and resources, especially in terms of training and equipment to respond to environmental emergencies. The volume of hazardous materials and hazardous waste that is transported in Texas-Tamaulipas communities demonstrates the need to develop and implement an adequate emergency response program. This includes adequately trained staff and equipment necessary to respond to emergencies. The lack of an adequate emergency response program could represent a risk to public health and the environment.

Proper management, treatment, and disposal of hazardous and solid wastes, as well as compliance with regulations for transboundary shipments of hazardous wastes, will remain a priority for the Texas-Tamaulipas region. Continued cooperation among the state and local offices will focus on: 1) ongoing information and technology transfer; 2) cooperative training; 3) building laboratory sampling and analysis capabilities; 4) developing recyclables markets; and 4) using and improving the US-Mexico Hazardous Waste Tracking Systems (HAZTRAKS) as a tracking and compliance tool.

One of the principal actions will be to improve waste management practices in the Texas-Tamaulipas region and promote solid and hazardous waste minimization and recycling. This will be accomplished by: developing partnerships with industry to encourage waste minimization and safe material management; providing site-specific compliance and technical assistance on an as-needed basis; training government officials, community leaders, and industry on waste reduction and pollution prevention.

Both governments will develop state and local abilities to be prepared for and to respond to chemical emergencies in the areas of Nuevo Laredo-Laredo, Reynosa-McAllen, and Matamoros-Brownsville. This will be accomplished through the Joint Response Team that involves federal, state and local agencies with responsibilities for dealing with environmental emergencies. Responsibilities of the Joint Response Team include: implementation of the Joint Contingency Plan in the mentioned sister cities for the creation and promotion of Local Committees for Mutual Assistance [Comité Local para Ayuda Mutua] (CLAMs); the creation of a communication center which responds to emergencies and is properly equipped, training of personnel involved in chemical emergency response; communication to the public; and other activities.

Reported releases of toxic waste from permitted facilities are listed in the Toxic Release Inventory. Table 29 summarizes this data.

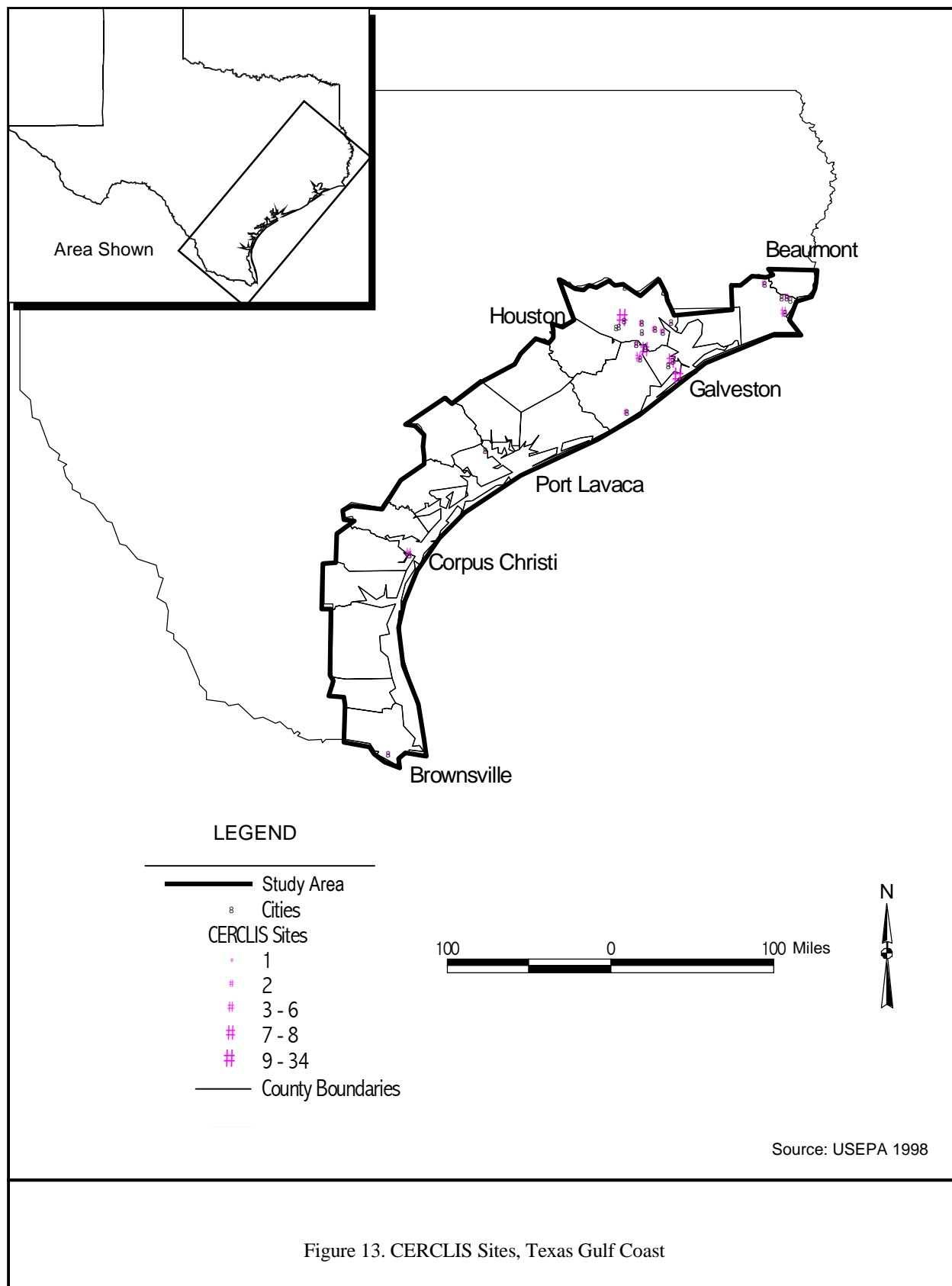
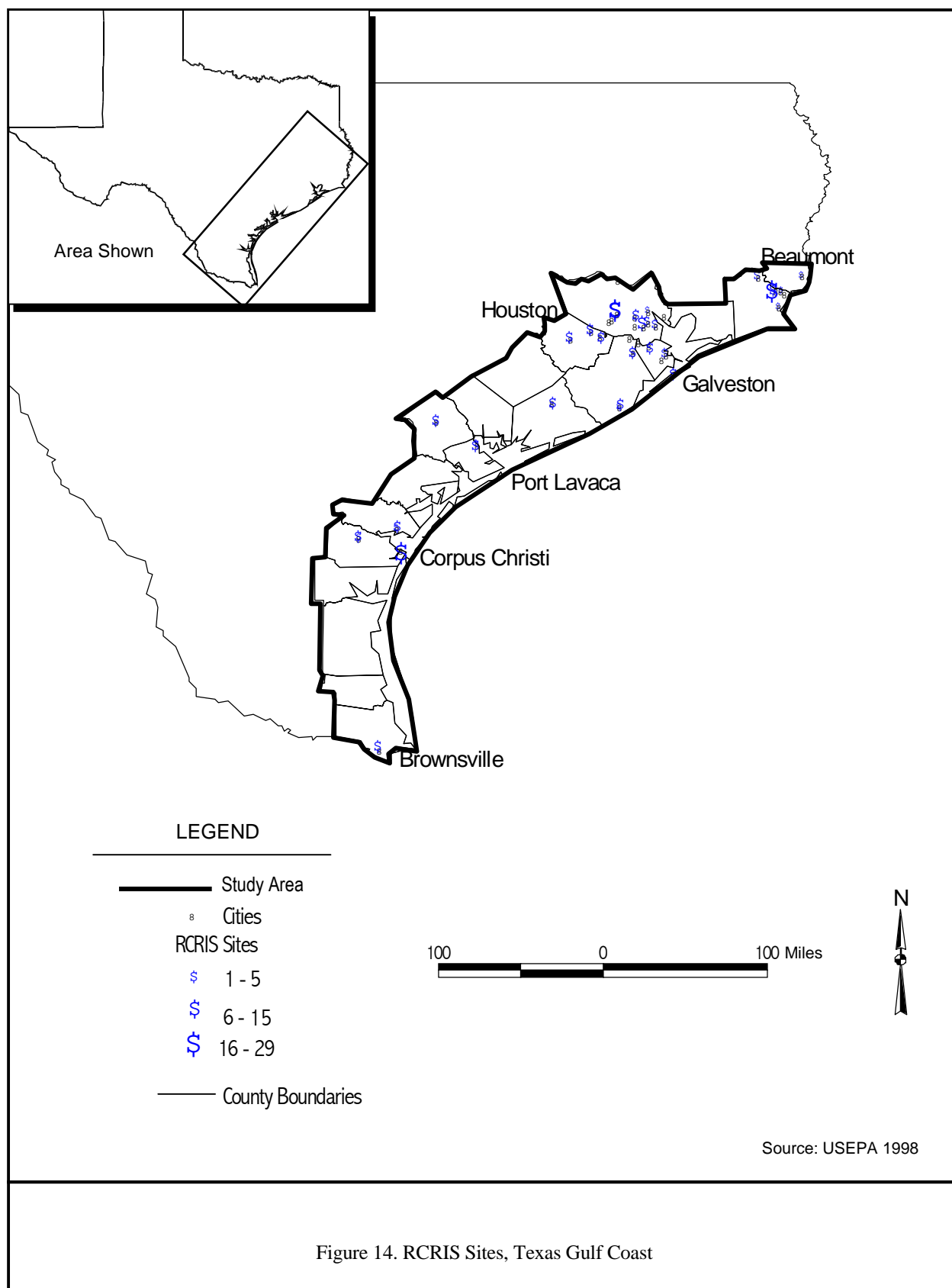
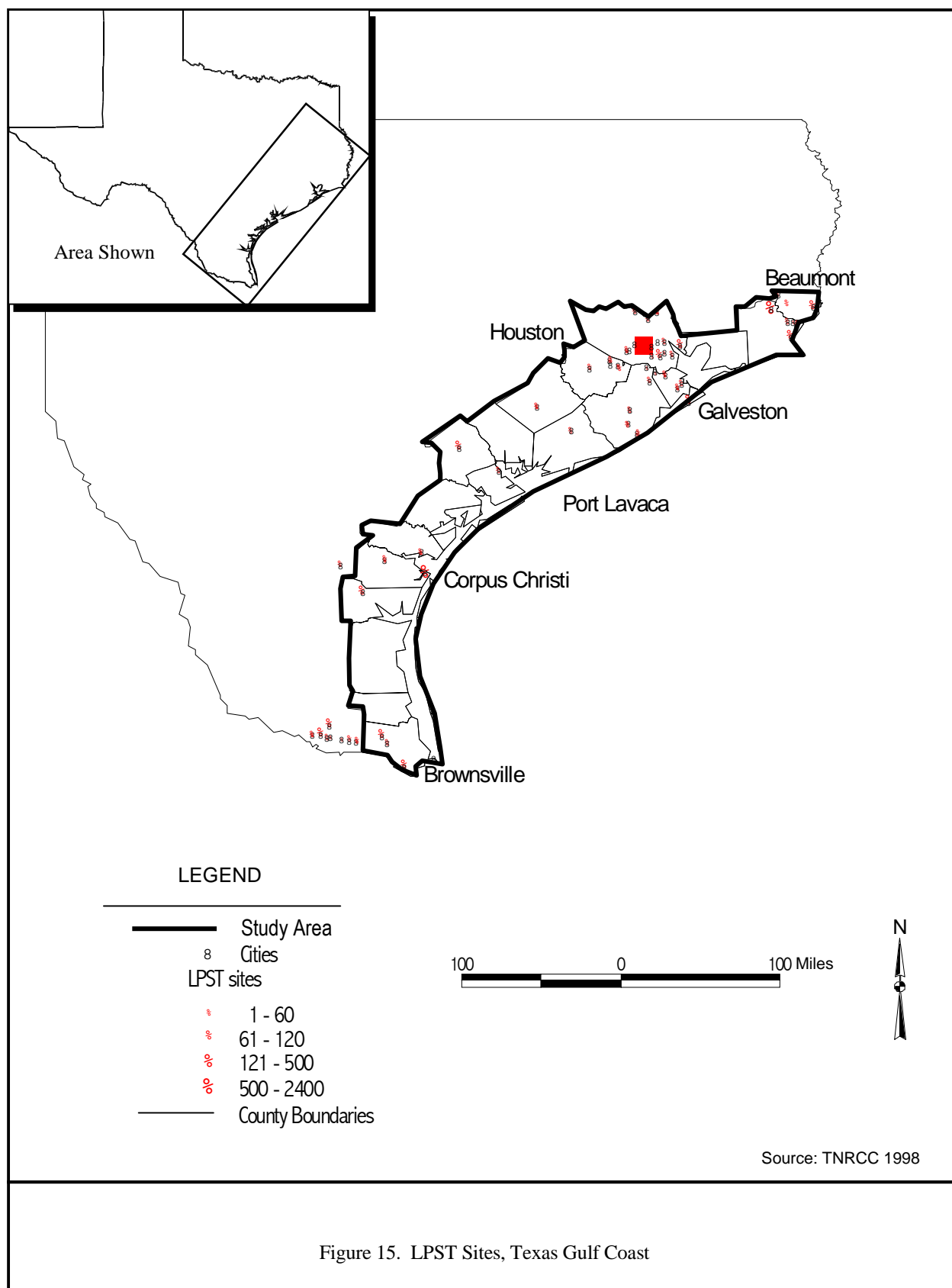


Figure 13. CERCLIS Sites, Texas Gulf Coast





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Table 28 – Hazardous Waste Sites by County along the Gulf Coastal Plains Province  
(Texas Gulf Coast)

COUNTY	CITY	CERCLIS	RCRIS	LPST
Aransas	Fulton	2	0	6
	Port Aransas	3	0	20
	Rockport	0	0	28
	Total County Sites:	5	0	54
Brazoria	Alvin	4	2	39
	Angleton	0	0	32
	Freeport	2	5	27
	Lake Jackson	0	0	16
	Old Ocean	0	1	3
	Pearland	2	0	25
	Surfside	2	0	1
	Total County Sites:	10	8	143
Calhoun	Point Comfort	1	1	1
	Port Lavaca	0	1	35
	Seadrift	0	1	7
	Total County Sites:	1	3	43
Cameron	Brownsville	1	2	120
	Gulf Coast	3	0	0
	Harlingen	0	0	97
	Los Fresnos	1	0	7
	Port Isabel	1	0	12
	San Benito	0	0	32
	Total County Sites:	6	2	268
Chambers	Anahuac	1	0	13
	Beach City	1	0	1
	Winnie	2	0	13
	Total County Sites:	4	0	27
Fort Bend	Katy	1	0	19
	Missouri City	0	1	11
	Richmond	0	0	17
	Rosenberg	0	1	37
	Stafford	0	1	16
	Sugar Land	0	1	3
	Thompsons	0	1	1
	Total County Sites:	1	5	104
Galveston	Crystal Beach	2	0	1
	Friendswood	3	0	15
	Galveston	26	1	74
	Gilchrist	1	0	0
	High Island	1	0	1
	Hitchcock	1	0	14
	La Marque	0	0	24
	League City	0	1	17
	Pelican Island	1	0	0
	Port Bolivar	2	0	0
	San Leon	0	2	2
	Texas City	8	10	46
	Total County Sites:	45	14	194

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Table 28 - Hazardous Waste Sites by County along the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

COUNTY	CITY	CERCLIS	RCRIS	LPST
Harris	Baytown	1	4	79
	Bellaire	0	0	12
	Channelview	0	3	33
	Crosby	2	0	22
	Deer Park	2	8	25
	Friendswood	5	0	15
	Galena Park	2	2	18
	Hatcherville	0	1	0
	Highlands	1	0	13
	Houston	34	29	2413
	Humble	0	0	45
	Katy	1	1	19
	Kingwood	0	0	10
	La Porte	2	8	42
	Pasadena	0	14	103
	Seabrook	1	2	8
	South Houston	1	0	10
	Spring	1	0	40
	Tomball	0	1	15
Total County Sites:		53	73	2922
Jefferson	Beaumont	2	9	289
	Groves	0	0	17
	Nederland	1	1	31
	Port Arthur	6	5	90
	Port Neches	2	4	14
	Sabine Pass	3	0	1
Total County Sites:		14	19	442
Jim Wells Co.	Alice	0	0	54
	Orange Grove	0	0	2
Total County Sites:		0	0	56
Kleberg Co.	Kingsville	0	0	72
Total County Sites:		0	0	72
Matagorda	Bay City	0	1	43
	Matagorda	1	0	2
	Palacious	1	0	0
Total County Sites:		2	1	45
Nueces	Bishop	0	1	8
	Corpus Christi	4	13	491
	Robstown	0	4	25
Total County Sites:		4	0	524
Orange	Bridge City	2	0	12
	Orange	0	3	82
	Vidor	0	0	20
Total County Sites:		2	0	102
Refugio	Refugio	0	0	24
Total County Sites:		0	0	24

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Table 28 - Hazardous Waste Sites by County along the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

COUNTY	CITY	CERCLIS	RCRIS	LPST
San Patricio	Portland	0	0	19
	Gregory	0	1	6
	Ingleside	0	1	12
	Sinton	0	1	16
	Total County Sites:	0	0	53
Victoria	Victoria	0	1	103
Total County Sites:		0	0	103
Wharton Co.	El Campo	0	0	21
Total County Sites:		0	0	21
Willacy	Raymondville	1	0	16
Total County Sites:		1	0	16
Total Texas Gulf Coast Sites:		152	160	5121

Source:

Table 29 - Toxic Release Inventory Data (x 1000 Lbs.)  
(Texas Gulf Coast )

County	Fugitive Air	Stack Air	Water	Underground	Land	Total
Aransas	0	527	0	0	0	527
Brazoria	3,667	5,511	14,424	11,413	259	35,277
Calhoun	1,550	1,972	14	10,537	9	14,083
Cameron	664	466	0	0	0	1,130
Chambers	172	169	2,209	0	0	2,552
Fort Bend	52	64	6	0	0	123
Galveston	1,855	4,612	167	14,206	30	20,871
Harris	16,903	14,301	1,256	15,133	651	48,246
Jackson	0	0	0	0	0	0
Jefferson	7,062	17,408	150	11,005	106	35,732
Kenedy	0	0	0	0	0	0
Kleberg	0	0	0	0	0	0
Matagorda	56	572	1	446	3	1,080
Nueces	1,186	1,617	370	1,227	11,321	15,723
Orange	2,264	4,127	36	1,106	427	7,961
San Patricio	89	22	.034	0	0	112
Victoria	191	527	1	23,376	12	24,109
Wharton	3	66	1	0	0	71
Willacy	0	0	0	0	0	0

(From USEPA Toxic Release Inventory System, 1996 Data)

## 2.0 Natural Environment

### 2.1 Biotic Provinces

A total of seven biotic provinces occur in Texas (Figure 16). Three biotic provinces transect the Gulf Coastal Plains Province of the Texas Gulf Coast segment of the study area: (1) Austroriparian, which extends into eastern Texas (western boundary - Harris County) and occupies a strip of coastal plain from the Gulf of Mexico to the Ouachita Mountains of Oklahoma; (2) Texan, bordering the Austroriparian in eastern Texas, is a broad ecotone between the southeastern pine/hardwood forests and the semi-arid grasslands to the west; and (3) Tamaulipan, which includes the Gulf Coastal Plains south of the Balcones Escarpment and west of the boundary between Refugio, Goliad, DeWitt, and Gonzales counties (Dice 1943; Blair 1950).

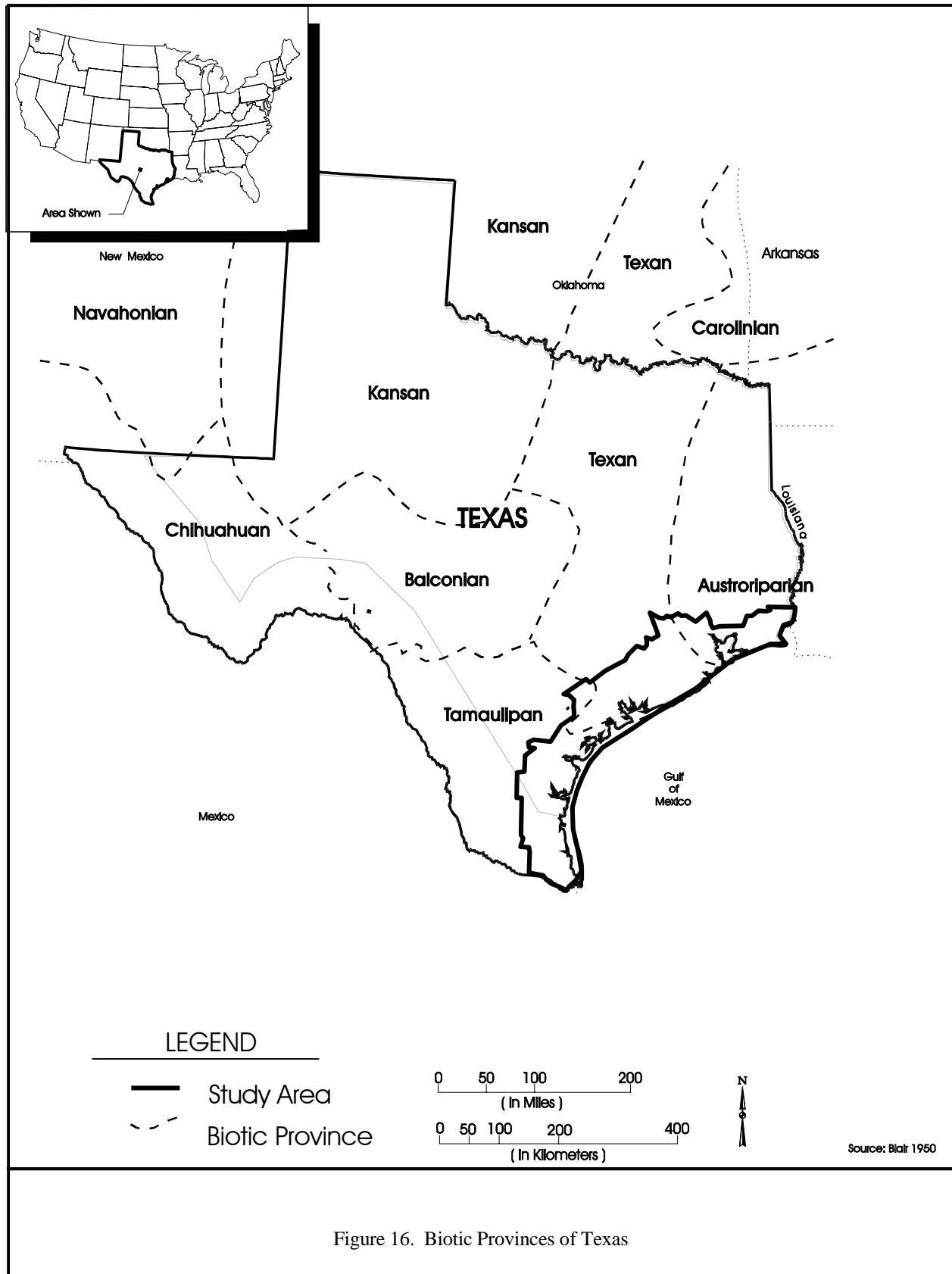
The Austroriparian biotic province, which includes Orange, Jefferson, Chambers, and Harris counties, consists of plants (e.g., mesic forest of pines and hardwoods) that are mostly adapted to ample or excess moisture. Wildlife species are typical of the southeastern coastal plain that would be dominated by mice, rats, treefrogs, and frogs along with numerous species of snakes, land turtles, salamanders, and a variety of waterfowl, shorebirds, and rangeland/forest birds. Within the Texan biotic province, the counties of Galveston, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, and Refugio, are characterized as subhumid with a intermixtures of eastern forest (e.g., pine-hardwood) and western grassland (e.g., tall grass prairie) associations and species. Rabbits, mice, various lizards, snakes, and amphibians (i.e., toads, true frogs, treefrogs) would represent wildlife species from both associations, plus a variety of waterfowl, shorebirds, and rangeland/forest birds. The Tamaulipan biotic province encompasses the counties of Aransas, San Patricio, Nueces, Kenedy, Willacy, and Cameron, and is characterized as semiarid with a dense growth of shrubs and small trees (e.g., thorny brush). Wildlife fauna includes a considerable element of neotropical species with a strong dilution of the Austroriparian and Sonoran species. These include rodents (e.g., pocket mice), numerous species of lizards, snakes, and amphibians (i.e., toads, true frogs), plus a variety of waterfowl, shorebirds, and rangeland/forest birds (Blair 1950). Appendix G provides a list of the common and scientific names of all plant and wildlife species used in this volume.

### 2.2 Vegetation Communities

The vegetation communities of Texas can be defined on the basis of the interaction of geology, soils, physiography, and climate. These vegetation areas set the stage for a wide array of land uses that vary from intensive cropland agriculture to extensive ranching and urban development. The major native vegetation community encompassing the Gulf Coastal Plains Province of the Texas Gulf Coast study area is the Gulf Prairies and Marshes which is divided into the Coastal Prairies and the Gulf Coast Marshlands. Major vegetation communities in the study area are discussed in the paragraphs below.

#### 2.2.1 Coastal Prairies

The Coastal Prairie is a nearly level, slowly drained plain covered mainly with agricultural crops and intermixed with a dominant bluestem grassland community (i.e., big/little bluestem, Indiangrass). A pecan-elm forest is found around the bottomlands and along reaches of the various streams (i.e., Brazos, Lavaca) flowing into the Gulf of Mexico. In addition, there are areas of mixed native or introduced grasses and forbs on grassland sites or mixed herbaceous communities resulting from the previous clearing of woody vegetation in Willacy and Cameron counties. Vegetation of the Gulf Coast Marshlands is limited to narrow belts of low wet marsh immediately adjacent to the coast and consists of four subtypes: maidencane-alligator weed (fresh) marsh, marshay cordgrass-olneyi three-square-leafy three-square (brackish) marsh, smooth cordgrass-marsh saltgrass-seas ox-eye (saline) marsh, and seaots-seaoat bluestem grassland.



#### 2.2.1.1 Bluestem grassland

The bluestem grassland community is evident over much of the Gulf Prairies and Marshes, particularly in the grassland area of Goliad, Victoria and Refugio Counties (McMahan et al. 1984). This community type also occurs in Jefferson, Chambers, Harris, Galveston, Fort Bend, Brazoria, Matagorda, Calhoun, and Aransas Counties of the Gulf Coastal Plains Province. Commonly associated plants include bushy bluestem, slender bluestem, little bluestem, silver bluestem, three-awn, buffalograss, bermudagrass, brownseed paspalum, single-spike paspalum, smutgrass, sacahuista, windmillgrass, southern dewberry, live oak, mesquite, huisache, baccharis, and Macartney rose.

#### 2.2.1.2 Pecan-Elm Forest

Pecan-Elm Forests are found in bottomlands of the Brazos, Colorado, Guadalupe, San Antonio, and Frio River basins and Gulf Coast Prairie reaches of the San Bernard, Navidad and Lavaca Rivers (McMahan et al. 1984). This community type occurs in Harris, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, and Victoria Counties of the Gulf Coastal Plains Province. Commonly associated plants include American elm, cedar elm, cottonwood, sycamore, black willow, live oak, Carolina ash, bald cypress, water oak, hackberry, virgin's bower, yaupon, greenbriar, mustang grape, poison oak, Johnsongrass, Virginia wildrye, Canada wildrye, rescuegrass, frostweed, and western ragweed.

#### 2.2.2 Marsh/Barrier Island

The Marsh/Barrier Island vegetation community type is the only type found within The Gulf Coast Marshland. To better describe this community it was divided into four subtypes. These include Subtype I (Fresh Marsh), Subtype II (Brackish Marsh), Subtype III (Saline Marsh), and Subtype IV (Seaoats/Seacoast Bluestem grassland). A description of each of these subtypes is presented in the following paragraphs.

##### 2.2.2.1 Subtype I – Maidencane-Alligator Weed (Fresh) Marsh

This community type occurs in hydric lowlands landward of brackish marsh within the coastal prairies and marshes (McMahan et al. 1984). It occurs in all counties of the Gulf Coastal Plains Province except for Harris, Fort Bend, Wharton, and Refugio. Commonly associated plants include water hyacinth, cattail, water-pennywort, pickerelweed, arrowhead, white waterlily, cabomba, coontail, and duckweed.

##### 2.2.2.2 Subtype II – Marshay Cordgrass-Olneyi Three-square-Leafy Three-square (Brackish Marsh)

This community type occurs generally landward of normal tidelands to storm within the coastal prairies and marshes (McMahan et al. 1984). It occurs in all counties of the Gulf Coastal Plains Province except for Harris, Fort Bend, Wharton, and Refugio. Commonly associated plants include big cordgrass, widgeon-grass, California bulrush, seashore paspalum, sacahuista, and common reed.

##### 2.2.2.3 Subtype III – Smooth Cordgrass-Marsh Saltgrass-Sea Ox-eye (Saline) Marsh

This community type occurs within tidally-inundated shores of bays of the Gulf Coast (McMahan et al. 1984). It occurs in all counties of the Gulf Coastal Plains Province except for Harris, Fort Bend, Wharton, and Refugio. Commonly associated plants include black rush, vidrillos, black mangrove, glasswort, seashore paspalum, and shoalgrass.

##### 2.2.2.4 Subtype IV – Seaoats-Seacoast Bluestem Grassland

This community type occurs on sandy coastal barrier islands from high tide mark to leeward marshes (McMahan et al. 1984). It occurs in all counties of the Gulf Coastal Plains Province except for Harris, Fort Bend, Wharton, and Refugio. Commonly associated plants include croton, single-spike paspalum, Pan American balsamscale, flat sedge, sea purslane, cenicilla, bulrush, beach morning glory, goatfoot, sea rocket, and lime prickly ash.

### 2.2.3 Pineywoods

The gently rolling to hilly forests of the Pineywoods consists of a longleaf pine-sandjack oak and young forest/grassland community in Orange County and a loblolly pine-sweetgum habitat in Jefferson, Chambers, and Harris counties. In addition, there is a willow oak-water oak-blackgum forest along the lower Sabine River, plus small areas of bald cypress-water tupelo swamp communities in Orange, Jefferson, and Chambers counties. Four vegetation community types are found within the Pineywoods. These include Pine-Hardwood Forest, Young Forest/Grassland, Willow Oak-Water Oak-Blackgum forest, and Bald Cypress-Water Tupelo Swamp.

#### 2.2.3.1 Pine-Hardwood Forest (Longleaf Pine-Sandjack Oak)

This community type occurs in Orange, Jefferson, Chambers, and Harris Counties within the Gulf Coastal Plains Province. Commonly associated plants include loblolly pine, shortleaf pine, blackjack oak, sand post oak, southern red oak, flowering dogwood, sweetgum, sassafras, American beautyberry, wax myrtle, yaupon, hawthorn, yellow jessamine, slender bluestem, broomsedge bluestem, and little bluestem.

#### 2.2.3.2 Young Forest/Grassland

This community type occurs in Orange County within the Gulf Coastal Plains Province. Commonly associated plants include various combinations and age classes of pine and regrowth southern red oak, sweetgum, post oak, white oak, black hickory, blackgum, elm, hackberry, and water oak resulting from recent harvesting of pine or pine-hardwood forest and subsequent establishment of young pine plantation or young pine-hardwood forest. Shrubs include hawthorn, poison oak, sumac, holly, wax myrtle, blueberry, blackberry, and red bay. This community type may also portray grasslands resulting from clearing of forests (McMahan et al. 1984).

#### 2.2.3.3 Willow Oak-Water Oak-Blackgum Forest

This community type occurs principally in the lower flood plains of the Sulphur, Neches, Angelina, Trinity and Sabine Rivers in the Pineywoods (McMahan et al. 1984). It is found in Orange County within the Gulf Coastal Plains Province. Commonly associated plants include beech, overcup oak, chestnut oak, cherrybark oak, elm, sweetgum, sycamore, southern magnolia, white oak, black willow, bald cypress, swamp laurel oak, hawthorn, bush palmetto, common elderberry, southern arrowwood, poison oak, supplejack, trumpet creeper, crossvine, greenbriar, blackberry, rhomboid copperleaf, and St. Andrew's cross.

#### 2.2.3.4 Bald Cypress-Water Tupelo Swamp

This community type occurs in swampy flatlands in the Pineywoods (McMahan et al. 1984). It is found in Orange and Chambers Counties within the Gulf Coastal Plains Province. Commonly associated plants include water oak, water hickory, swamp blackgum, red maple, swamp privet, buttonbush, possum haw, water elm, black willow, eardrop vine, supplejack, trumpet creeper, climbing hempweed, bog hemp, water fern, duckweed, water hyacinth, bladderwort, beggar-ticks, water paspalum, and St. John's wort.

### 2.2.4 Post Oak/Savannah

Only the western border of Jackson and Victoria counties is interspersed with post oak woods/forest and grassland mosaic of the gently rolling to hilly Post Oak/Savannah community. This community type is most apparent on sandy soils. Commonly associated plants include blackjack oak, eastern red cedar, mesquite, black hickory, live oak, sandjack oak, cedar elm, hackberry, yaupon, poinson oak, American beautyberry, hawthorn, supplejack, trumpet creeper, dewberry, coral-berry, little bluestem, silver bluestem, sand lovegrass, beaked panicum, three-awn, sprangle-grass, and tick-clover.

#### 2.2.5 South Texas Plains

West of the San Marcos Arch, (a positive structural feature running southeastward from the Llano uplift, this broad, plunging arch defines the upper coast from the central and lower coast), the vegetation community becomes predominantly the level to rolling South Texas Plains and consists of the following habitats: mesquite-live oak-bluewood parks, mesquite-blackbrush brush, mesquite-granjeno woods/parks, and live oak woods/parks (Frye et al. 1984; McMahan et al. 1984; Hatch et al. 1990).

##### 2.2.5.1 Mesquite-Live Oak-Bluewood Parks

This community type occurs primarily in Uvalde, Medina, and Bee Counties of the South Texas Plains (McMahan et al. 1984). It is also found in Refugio and San Patricio Counties within the Gulf Coastal Plains Province. Commonly associated plants include huisache, whitebrush, granjeno, lotebush, Berlandier wolfberry, blackbrush, desert yaupon, Texas pricklypear, woollybucket bumelia, tasajillo, agarito, Mexican persimmon, purple three-awn, Roemer three-awn, pink pappusgrass, Halls panicum, slimlove poppymallow, sensitive briar, two-leaved senna, and mat euphorbia.

##### 2.2.5.2 Mesquite-Blackbrush Brush

This community type occurs principally on shallow, gravelly or loamy soils in the South Texas Plains (McMahan et al. 1984). Mesquite-Blackbrush brush is found in Refugio, San Patricio, Nueces, Willacy, and Cameron Counties within the Gulf Coastal Plains Province. Commonly associated plants include lotebush, ceniza, guajillo, desert olive, allthorn, whitebrush, bluewood, granjeno, guayacan, leatherstem, Texas pricklypear, tasajillo, kidneywood, yucca, desert yaupon, goatbush, purple three-awn, pink pappusgrass, hairy tridens, slim tridens, hairy grama, mat euphorbia, coldenia, dogweed, knotweed leafflower, and two-leaved senna.

##### 2.2.5.3 Mesquite-Granjeno Woods/Parks

This community type occurs principally on sandy or loamy soils of the South Texas Plains (McMahan et al. 1984). Mesquite-Granjeno woods are found in Nueces, Kleberg, Kenedy, and Willacy Counties. Commonly associated plants include bluewood, lotebush, coyotillo, guayacan, Texas colubrina, tasajillo, Texas pricklypear, Pan American balsamscale, single-spike paspalum, hooded windmillgrass, tanglehead, Roemer three-awn, purple three-awn, tumble lovegrass, bull nettle, croton, slender, Texas lantana, silverleaf nightshade, and firewheel.

##### 2.2.5.4 Live Oak Woods/Parks

This community type occurs principally on sandy soils in Refugio, Kenedy, and Brooks Counties of the South Texas Plains (McMahan et al. 1984). Live Oak Woods/Parks are also found in Aransas, San Patricio, and Kleberg Counties of the Gulf Coastal Plains Province. Commonly associated plants include Texas pricklypear, lime pricklypear, greenbriar, bush sunflower, tanglehead, single-spike paspalum, fringed signal grass, croton, silverleaf nightshade, bull nettle, Texas lantana, dayflower, silverleaf sunflower, and shrubby oxalis.

#### 2.2.6 Other

##### 2.2.6.1 Crops

This community type includes all cultivated cover crops or row crops providing food and/or fiber for either man or domestic animals. It also portrays grassland associated with crop rotations. Crop lands are found statewide and are a major vegetation community type in the Gulf Coastal Plains Province. Crop lands are located in all counties of the Province except for Aransas and Kenedy.

##### 2.2.6.2 Other Native and/or Introduced Grasses

This community type is principally located in northeast, east-central and south Texas (McMahan et al. 1984). It is found in Harris, Willacy, and Cameron Counties within the Gulf Coastal Plains Province. Commonly associated plants include mixed native or introduced grasses and forbs on grassland sites or mixed herbaceous communities resulting from the clearing of woody vegetation. This community type occurs in the South Texas plains where brush has been cleared. Such areas are particularly subject to change due to regrowth brush (McMahan et al. 1984).

### 2.3 Wildlife Communities

Texas contains an enormous diversity of environments for wildlife. The distribution of these environments is controlled generally by climatic conditions as well as locally by topographic factors. Physiographic features such as scarps, plateaus, plains, mountains, and drainage systems also influence wildlife distribution along with soil types.

#### 2.3.1 Land (Terrestrial) Communities

The Texas Gulf Coast is subdivided into three areas: (1) Upper Coast - Sabine River on the Louisiana border to Port O'Connor (Calhoun County), including a portion of East Texas - the heavily wooded areas north of Houston and Beaumont; (2) Central Coast - Port O'Connor to Baffin Bay, south of Corpus Christi (Kleberg County); and (3) Lower Coast - Baffin Bay to the mouth of Rio Grande (Cameron County). Area (1) is influenced by the mesic forest species of the Austroriparian Biotic Province and the interdigitation of the pine/hardwood forests and western grassland species of the Texan Biotic Province, while areas (2) and (3) are characterized by an intermixture of Neotropical, Eastern coastal plain, and southwestern desert species.

The native faunal components of the Texas Gulf Coast support 484 species of birds which are dominated by wood warblers (48 species), swans, geese, and ducks (38 species), sparrows and towhees (35 species), sandpipers and phalaropes (35 species), gulls, terns, and skimmers (28 species), and tyrant flycatchers (26 species). The majority of these species occur in spring and fall when neotropical migrants (e.g., flycatchers, warblers) pass through on their way to either summer breeding or wintering grounds and during winter when summer resident birds (i.e., robins, kinglets, and sparrows) from the north arrive to spend the winter. The majority of the 105 mammalian species found in the study area are insectivorous bats and rodents (e.g., rats and mice) with rodents being the most commonly encountered mammals. Only 45 species of amphibians are found within the study area with toads, treefrogs, and true frogs being the most abundant and common groups comprising 58 percent of the population. The reptilian community, consisting of 117 species, is dominated by the commonly found colubrid snakes (43 percent: small burrowing; large, brown-blotted terrestrial; racers, indigo, and whipsnakes; and aquatic snakes) and various species of commonly occurring iguanid lizards, skinks, and water and box turtles. Appendices H and I list the common wildlife species for the upper and lower coast counties (Blair 1950; Davis 1974; Schmidly 1983, 1991; Tennant 1985; Dixon 1987; Garrett and Barker 1987; Jones and Jones 1992; Holt 1993).

#### 2.3.2 Water (Aquatic) Communities

Distribution patterns of freshwater fish in Texas closely resemble those of terrestrial organisms with the controlling factor being climate and geology (Blair 1950). Collections from the two major faunal provinces of nearctic freshwater fish fauna (Western Gulf slope and Rio Grande) along the Texas Gulf Coast exhibit a progressive decline in the number of fish species from the Upper Coast (Western Gulf slope: Sabine-Neches-Trinity-San Jacinto: 141 species, Brazos-Colorado: 118 species, Guadalupe-Nueces: 96 species) to the Lower Coast (Rio Grande: 76 species). Dominant fish in the Texas Gulf Coast rivers are carps, minnows, and sunfishes, while the lower portion of the Rio Grande Basin, which has been diverted for irrigation purposes, is dominated by estuarine and marine forms (herrings, drums, and jacks). Fishes found in the Texas Gulf Coast rivers and Lower Rio Grande Basin within the study area are listed in Appendix J(Conner and Suttkus 1986; Edward and Contreras-Balderas 1991; Hubbs et al. 1991).

The northwestern Gulf of Mexico provides a variety of environments for fishes with two natural gradients contributing to the diversity of habitats: variation in salinities (low to hypersaline) and variation in depth from the shore to the edge of the continental shelf. The fish fauna of the northwestern Gulf of Mexico may be divided into temperate and tropical components as well as distinct habitats (e.g., offshore reefs). The inshore Gulf and estuarine habitats appear to share a common fauna: (1) low salinity to freshwater marshes, salt marshes, and grass flats - gars, killifishes, mullets, drums,

and gobies; (2) oligohaline bays - drums, anchovies, mullets, and menhaden; and (3) hypersaline bays - drums and mullets. In the surf zone, with its open, sandy bottom, characteristically contains fishes such as drum and threadfins, while outside this zone where the bottom turns muddy, the characteristic fishes are represented by drums and porgies. Farther offshore towards the middle shelf the number of drum are drastically reduced with the fish community being dominated by small sea basses, flounders, and sea robins. Natural rocky areas are absent from the inshore area, except for one very small area off Port Mansfield (Seven and One-Half Fathom Reef), however, piers, jetties, and bulkheads provide a suitable habitat for such species as porgies, blennies, gobies, and sea basses. The offshore reefs, with their more tropical fauna, support such distinctive forms as butterflyfishes, angelfishes, damselfishes, wrasses, parrotfishes, and several species of tropical sea basses. Juveniles of some of these species may occur inshore around the jetties and pilings of South Texas and some of the inshore oil platforms. Twenty-nine fish species are commonly found throughout the Texas estuaries and bays with drum being the predominant form. Fishes found in the various estuaries and bays of the study area are listed in Appendix J (Hoese and Moore 1977; Nelson 1992).

#### 2.4 Shoreline Communities

Numerous types of invertebrates and non-vascular plants form an extensive biotic community within the various shoreline habitats along the Texas Gulf Coast. The shoreline consists of the following types of shore communities: (1) hard shore - inlet-protecting jetties, breakwater groins, and pilings; (2) soft shore-sands, spits, barrier islands, bays, and lagoons; and (3) subtidal sands and banks. Within the hard shore community, three primary types of biotic zonation can be distinguished: (1) a supralittoral zone and fringe characterized by snails and isopods; (2) a midlittoral barnacle zone with oysters, gastropods, anemones, and crabs; and (3) a sublittoral fringe and zone characterized by several species of macroscopic and epiphytic algae including sea urchins and sea hares.

Life zones on soft shores (beach and barrier islands) are best described in terms of physical features and would be represented by the following types of biota: foreshore (intertidal sand) - surf clams, sand-dwelling crustacea (i.e., mole crabs, ghost or mud shrimp), and strand biota (i.e., jellyfish, bivalve molluscs, Gulfweed with attached epiphytes); backshore - ghost crab; and upper shore - insects (e.g., tiger beetles) and land crabs. Estuarine biota of the bays and lagoons are represented by the blue crab and various species of fiddler and hermit crabs, bivalve molluscs (clams), gastropods, shrimp (i.e., grass, pink, brown, and white), benthic annelid worms, macroplankton (i.e., jellyfish, squids, ctenophores), and various species of green and blue-green algae.

The offshore subtidal sands and overlying waters are highly productive, containing numerous microscopic diatoms, dinoflagellates and other algae, in addition to a relatively rich assemblage of crustaceans (i.e., white, pink, and brown shrimp, crabs), bivalve molluscs (15 species), predatory gastropods and starfishes, softbodied segmented worms (polychaetes), cnidarians, and echinoderms. Three groups of biota characterize Seven and One-Half Fathom Bank (an example of a subtidal hard bank): (1) the fouling community with tube-dwelling polychaetes, sessile hydroids, bryozoans, tunicates, sponges, and leafy macrophytes; (2) borers consisting of bivalves; and (3) errant opportunists including molluscs (187 species), crustaceans (i.e., shrimp and crabs), and echinoderms (e.g., sea urchins) (Britton and Morton 1989).

#### 2.5 Threatened/Endangered Species and Critical/Sensitive Habitats

The Endangered Species Act (ESA) [16 U.S.C. 1531 et. seq.] of 1973, as amended, was enacted to provide a program for the preservation of endangered and threatened species, and to provide protection for the ecosystems upon which these species depend for their survival. All federal agencies are required to implement protection programs for these designated species and to use their authorities to further the purposes of the act. Responsibility for the identification of a threatened or endangered species and any potential recovery plans lies with the Secretary of the Interior and the Secretary of Commerce.

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) share responsibility for administration of the Endangered Species Act. Generally, the National Marine Fisheries deals with those species occurring in marine environments and anadromous fish, while the Fish and Wildlife Service is responsible for terrestrial and freshwater species and migratory birds. Additionally, the Animal and Plant Health Inspection Service, in the Department of Agriculture, oversees importation and exportation of listed terrestrial plants. The USFWS

responsibilities under the ESA include: (1) the identification of threatened and endangered species; (2) the identification of critical habitats for listed species; (3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other federal agencies concerning measures to avoid harm to listed species.

An endangered species is a species which is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those which have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered endangered or threatened if they meet any of the five following criteria:

- (1) The current/imminent destruction, modification, or curtailment of their habitat or range;
- (2) Overuse of the species for commercial, recreational, scientific, or educational purposes;
- (3) Disease or predation;
- (4) The inadequacy of existing regulatory mechanisms; and
- (5) Other natural or human-induced factors affecting continued existence (Reed and Drabelle 1984).

In addition, the USFWS also classifies species as candidates (C), proposed threatened (PT), and proposed endangered (PE). The candidate designation includes those species for which the USFWS has identified threats to their continued existence, has sufficient information on hand to support their being listed as either endangered or threatened, and are likely to be proposed for listing in the foreseeable future. Proposed species are those which have been formally submitted to Congress for official listing as threatened or endangered.

The ESA also calls for the conservation of Critical Habitat - the areas of land, water, and air space which an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to most species is the destruction or modification of essential habitat areas by uncontrolled land and water development.

#### 2.5.1 Federal

A total of 24 federal endangered, threatened, or candidate species occur or potentially occur within the study area from Port Arthur to Brownsville. Seventeen species are listed as endangered, four as threatened, and three as candidate. Information pertaining to distribution, habitat requirements, and reason for decline of these species is listed in Table 30. The location of endangered, threatened, and rare species by habitat and latitude/longitude in all coastal counties of the study area are listed and illustrated in the Coastal Region Spill Response Map Series (USFWS 1992c, 1992d, 1999; U.S. Department of Commerce 1993; TPWD 1998).

#### 2.5.2 Critical Habitats

One federally-designated critical habitat (land, water, and air) exists for the whooping crane in the Aransas National Wildlife Refuge in Aransas, Calhoun, and Refugio counties (Arroyo 1992; USFWS 1992a; 1999).

#### 2.5.3 Sensitive Habitats

The Lower Rio Grande Valley, in the U.S. and Mexico, is a culturally and ecologically important and diverse corridor. A binational planning effort, the Caminos del Rio Heritage project, is now underway to conserve the unique natural and cultural heritage along the Rio Grande, from the Laredo/Columbia area to the Gulf of Mexico. With technical assistance from the National Park Service, this "heritage corridor" preservation effort includes two national parks, 196 National Register historic sites, four state parks, and the Lower Rio Grande Valley National Wildlife Refuge (American Rivers 1993).

The Lower Rio Grande Valley National Wildlife Refuge (The Wildlife Corridor) will encompass some 107,500 acres within the four-county area of Cameron, Willacy, Hidalgo, and Starr counties. In addition to the Rio Grande Wildlife Corridor stretching from Falcon Dam to the Gulf of Mexico, the Lower Rio Grande Valley Refuge Acquisition Plan has identified other key areas, which, although removed from the Rio Grande, will serve as anchor wildlife areas, providing

corridors for wildlife species migrating north and south. The plan developed for the Lower Rio Grande Valley NWR identifies 10 different habitat types: Coastal Brushland Potholes, Loma/Tidal Flats, Woodland Potholes and Basins, Mid-Delta Thorn Forests, Sabal Palm Forest, Mid Valley Riparian Woodland, Upland Thorn Scrub, Barretal (thicket), Upper Valley Flood Forest, and Chihuahuan Thorn Forest (Falcon Woodland). These habitats not only serve to reflect the natural diversity of the area, but also hold the key to the survival of one or more of the 115 unique vertebrate species in the region that are listed as endangered, threatened, or which occur at the periphery of their range. Six of these habitats types: Coastal Brushland Potholes, Loma/Tidal Flats, Woodland Potholes and Basins, Mid-Delta Thorn Forests, Sabal Palm Forest, and Mid Valley Riparian Woodland are located within Cameron and Willacy counties (Jahrsdoerfer and Leslie 1988; USFWS 1992a).

Falling within the priority habitat migratory range for waterfowl (West-Central Gulf Coast Region) as designated by the North American Waterfowl Management Plan, numerous bird rookeries (197) occur along the Texas Gulf Coast with the heaviest concentration situated in Galveston (37) and Nueces (29) counties. The Coastal Region Spill Response Map Series lists and illustrates the location of these bird habitats by sites and latitude/longitude within the various counties. In addition, Pelican Island in Corpus Christi Bay and Sundown Island in Matagorda Bay have been the most consistently used islands in recent years and sustain the largest populations of brown pelicans. (USFWS 1986, 1992b; Arroyo 1992).

#### 2.5.4 State

Within the State of Texas, the Resources Protection Division of the Texas Parks and Wildlife Department (TPWD) Natural Heritage Program maintains computerized records of state endangered and threatened species by county. The State of Texas does not list species the same as the federal government. When the USFWS lists a plant species, the State of Texas then lists that plant. Thus, the list of endangered/threatened plants in Texas is the same as the federal list. However, the State of Texas has separate laws governing the listing of animal species as endangered/threatened in the state. Animals that are not currently federally listed may be listed as state endangered/threatened. The state does not have the authority at this time to list invertebrates, as does the federal government.

The TPWD has two species status categories, endangered in the State of Texas and threatened in the State of Texas. The State of Texas lists 21 endangered species (six plants, one amphibian, three reptiles, seven birds, and four mammals) and 45 threatened species (four fish, five amphibians, twelve reptiles, seventeen birds, and seven mammals). Appendix K lists these 66 species by county within the study area (TPWD 1988, 1993a, 1993b, 1993c, 1998).

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Table 30 - Distribution, Habitat Requirements, and Reasons for Decline of Federal Endangered, Threatened, and Candidate Species Potentially Occurring in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Common/Scientific Name	Status	Occurrence by Counties	Habitat Requirements/Reasons for Decline
<b>PLANTS</b>			
Black-lace cactus <i>Echinocereus reichenbachii</i> var. <i>albertii</i>	E	Kleberg, Refugio	Brushy, grassy areas where the Gulf Coastal Plain meets inland mesquite shrubland/overcollecting, habitat destruction, and trampling on overgrazed lands
Slender rush-pea <i>Hoffmannseggia tenella</i>	E	Nueces, Kleberg	Barren openings or where low native grasses persist and near creeks/habitat loss due to conversion of Gulf Coastal Prairies to agriculture and competition from non-native grasses
South Texas ambrosia <i>Ambrosia cheiranthifolia</i>	E	Cameron, Kleberg, Nueces	Open clay-sandy loam prairies and Savannah/habitat destruction
Star cactus <i>Astrophytum asterias</i>	E	Cameron	Open shrubland on clay, and gravelly slopes on flats at low elevation/agricultural land conversion
Texas ayenia <i>Ayenia limitaris</i>	E	Cameron	Dense subtropical woodland communities/habitat destruction
Texas prairie dawn <i>Hymenoxys texana</i>	E	Fort Bend, Harris	Poorly drained depressions around the periphery of low, mima mounds in open grasslands/habitat destruction and alteration due to residential development and road construction
<b>REPTILES/AMPHIBIANS</b>			
Hawksbill sea turtle <i>Eretmochelys imbricata</i>	E	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Matagorda, Kleberg, Nueces, Willacy, Refugio, San Patricio	Beaches for nesting, and open ocean/commercial trade
Green sea turtle <i>Chelonia mydas</i>	T	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Willacy, Refugio, San Patricio	Pelagic, undisturbed beaches for nesting/loss and disturbance of nesting habitat, incidental mortality caused by fishing nets, and hunting
Kemp's Ridley sea turtle <i>Lepidochelys kempii</i>	E	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Willacy, Refugio, San Patricio	Pelagic, undisturbed beaches for nesting/loss of nesting habitat, shrimp nets

Table 30 - Distribution, Habitat Requirements, and Reasons for Decline of Federal Endangered, Threatened, and Candidate Species Potentially Occurring in the Gulf Coastal Plains Province(continued)  
(Texas Gulf Coast)

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Common/Scientific Name	Status	Occurrence by Counties	Habitat Requirements/Reasons for Decline
<b>REPTILES/AMPHIBIANS (Continued)</b>			
Leatherback sea turtle <i>Dermochelys coriacea</i>	E	Aransas Brazoria Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Willacy, Calhoun, Refugio, San Patricio	Pelagic, nests on undisturbed beaches/beachfront development, plastic trash, and incidental take by commercial fisherman
Loggerhead sea turtle <i>Caretta caretta</i>	T	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Willacy, Refugio, San Patricio	Pelagic, undisturbed beaches for nesting/loss and disturbance of nesting habitat, and incidental take by commercial fishermen
Cagle's map turtle <i>Graptemys caglei</i>	C	Victoria	Restricted to the Guadalupe and San Antonio River watersheds of south-central Texas./limited habitat, human disturbance
<b>BIRDS</b>			
American peregrine falcon <i>Falco peregrinus anatum</i>	E	Aransas, Calhoun, Cameron, Kenedy, Kleberg, Nueces, Refugio, San Patricio, Willacy	Nests on cliffs and buildings/pesticides, habitat loss, indiscriminate shooting, habitat loss, recreational use and development, and illegal collecting
Attwater's greater prairie-chicken <i>Tympanuchus cupido attwateri</i>	E	Aransas, Fort Bend, Galveston, Refugio, Victoria	Short, mid and tall grass prairie/habitat loss and alteration due to agricultural practices, development, brush invasion, over-grazing, and competition with introduced species (pheasants)
Bald eagle <i>Haliaeetus leucocephalus</i>	T	Brazoria, Calhoun, Chambers, Fort Bend, Harris, Jackson, Matagorda, Refugio, Victoria, Wharton, Orange, Jefferson, Galveston, Aransas, Kleberg, Cameron	Mature conifer forests near open water/pesticides, human encroachment (shooting), and degradation and loss of riparian habitat
Brown pelican <i>Pelecanus occidentalis</i>	E	Aransas, Brazoria, Calhoun, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, Willacy	Sea coasts and coastal islands/pesticides, human disturbances, and loss of habitat due to commercial and urban development

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Table 30 - Distribution, Habitat Requirements, and Reasons for Decline of Federal Endangered, Threatened, and Candidate Species Potentially Occurring in the Gulf Coastal Plains Province(continued)  
(Texas Gulf Coast)

Common/Scientific Name	Status	Occurrence by Counties	Habitat Requirements/Reasons for Decline
<b>BIRDS (continued)</b>			
Mountain plover <i>Charadrius montanus</i>	C	Matagorda, Victoria, Refugio, Aransas, San Patricio, Nueces, Kleberg, Willacy, Cameron	Shortgrass prairie and arid plain/loss of habitat
Northern aplomado falcon <i>Falco femoralis septentrionalis</i>	E	Cameron, Kenedy, Kleberg, Willacy	Open rangeland, savanna, grasslands/habitat degradation, and organochlorine pesticides
Piping plover <i>Charadrius melodus</i>	T	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Refugio, San Patricio, Willacy	Beaches, sand bars/habitat disturbance due to commercial, residential and recreational development, and dune stabilization
Whooping crane <i>Grus americana</i>	E	Aransas, Brazoria, Calhoun, Matagorda, Refugio, Victoria	Wilderness wetlands/diminished habitat, and human disturbance
<b>MAMMALS</b>			
Jaguarundi <i>Felis yagouaroundi</i>	E	Aransas, Cameron, Kenedy, Kleberg, Nueces, Refugio, San Patricio, Willacy	Chaparral, mesquite thickets near streams/predator control, and habitat loss
Ocelot <i>Felis pardalis</i>	E	Aransas, Cameron, Matagorda, Nueces, Refugio, Kenedy, Kleberg, San Patricio, Willacy	Southwestern brushlands/hunters and loss of habitat due to brush clearing
West Indian Manatee <i>Trichechus manatus</i>	E	Cameron, Galveston, Matagorda, Willacy, Nueces	Inlets, river mouths, ocean (coastal)/powerboats, poaching, habitat loss
Gulf Coast hog-nosed skunk <i>Conepatus leuconotus texensis</i>	C	Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, Cameron	Dense vegetation usually away from urban/developed areas/loss of habitat, human disturbance

Legend: E=Endangered; T=Threatened; PE=Proposed Endangered; PT=Proposed Threatened; C=Candidate; NA=Not Available

Source: Correll and Johnston 1979; Schmidly 1983; Poole and Riskind 1987; Matthews and Mosely 1990; DeGraaf et al. 1991; Arroyo 1992; Feierabend 1992; Mosley 1992; USFWS 1992c, 1993b, 1993c; U.S. Department of Commerce 1993; Texas Parks and Wildlife 1998.

## 2.6 Unique or Sensitive Areas

A wide variety of unique or sensitive areas exist in the Texas Gulf Coast which are important to fish and wildlife resources. These include resacas, springs, coastal barriers, wild and scenic/endangered rivers, and wetlands. These areas are important for sustaining population sizes of some fish and wildlife species because of unique species diversity or hydrological regime.

### 2.6.1 Resacas, Springs, and Coastal Barriers

Resacas are old abandoned river channels measuring from 0.3 to 2.0 meters deep and 10 to 50 meters wide. These semipermanent bodies of water often forming a long quiet pond or oxbow (i.e., Bayside Resaca Area in the Laguna Atascosa National Wildlife Refuge and Playa del Rio) occur along the Lower Coast (Edwards et al. 1989).

Springs are the spillways through which the overflow or surplus groundwater passes and may be classified as artesian or gravity. Artesian springs flow under pressure, generally through some fissure or other opening in the confining bed which overlies the aquifer, while gravity springs drain from their aquifers with no additional pressure. The study area along the Texas Gulf Coast consists of many seeps (87) and small springs, with three medium-size springs located in Calhoun, Victoria, and Willacy counties (Brune 1981).

Coastal barriers are offshore ridges such as bars, beaches, islands, spits, peninsulas, and other land forms found all along the Texas Gulf Coast. The coastal barriers include adjacent wetlands, marshes, estuaries, inlets, and nearshore waters. They are primarily located in the Gulf Prairies and Marshes ecoregion of the study area (Jenkins 1989).

### 2.6.2 Wild and Scenic/Endangered Rivers

A wild and scenic river, as designated by the U.S. Department of the Interior, is a river, stream, or bayou, or segment of a river, stream, or bayou that is in a free-flowing condition; does not contain any man-made structures that form a slack water pool; has not been channelized; has not been cleared and snagged in the past 25 years; has not been realigned, inundated, or otherwise altered; has no or few man-made structures along its banks; is generally inaccessible; and is unpolluted. The only wild and scenic river nationally designated within the study area is the Rio Grande (USDI 1998).

Rivers on American's most endangered list are selected because of: (1) their importance as natural resources and to human health, (2) the degree of threat they are experiencing, and (3) the imminence of threats the rivers are facing. The Rio Grande is considered an endangered river due to the proposed development of three major radioactive and hazardous waste landfills near the river, which threaten to contaminate the Rio Grande as well as important groundwater aquifers. Lack of adequate municipal and industrial sewage treatment facilities along the border continues to pose environmental and health risks to local residents (American Rivers 1993).

### 2.6.3 Wetlands

#### 2.6.3.1 Types of Wetlands

A wide variety of wetland types exist in the Texas Gulf Coast which are important to fish and wildlife resources. Because of unique species diversity or hydrological regime, wetlands are vital for maintenance of some fish and wildlife species at sustainable population sizes. Bottomland hardwoods, riparian systems, coastal wetlands, and coastal pothole wetlands are the most important general categories of wetlands found in the study area.

Bottomland hardwood forests are wetlands ecologically dependent on fluctuating water levels and usually depend on overbank flooding from rivers and streams. These wetlands range from permanent-water cypress swamps to transitional oak-forest on the upper terrace interspersed with oxbow lakes, freshwater bogs and marshes, and occasionally very small shallow depressions supporting aquatic beds. A portion of the bottomland hardwoods of East Texas occur within the study area in the Pineywoods located in the northern sections of Orange (i.e., Blue Elbow Swamp, North Orange County Bottom), Jefferson (e.g., Giant Palmetta), Chambers, and Harris counties. This type of wetlands is also found in river valleys passing through the lower coastal plain as far south as the Brazos River. The

predominant wetland types: palustrine emergent, palustrine forested, and palustrine scrub-shrub are characteristic of bottomland hardwood areas (McMahan and Frye 1987; USFWS 1990b).

Riparian systems and the associated woodlands are widespread throughout the study area. Their hydrologic regimes are greatly influenced by proximity to an aquatic ecosystem and usually occur as an ecotone between aquatic and upland ecosystems. Most riparian habitats can be categorized into discrete forest cover types according to their elevation above water level and vegetation structure within the community. These types of systems would occur in the riparian forests of the Rio Grande Plains (i.e., Aransas and Nueces rivers, Rio Grande). Riparian systems are classified as palustrine emergent, palustrine forested, and palustrine scrub-shrub (Drawe et al. 1978; Taylor 1982; Jahrsdoerfer and Leslie 1988; USFWS 1990b).

Coastal wetlands are found in all counties of the study area along the Texas Gulf Coast and consist of salt/freshwater marshes, deltas, coastal bays, and estuaries. The predominant marshes are the intertidal non-vegetated, emergent, and scrub-shrub emergent marshes along the periphery of the coastal estuaries, and the freshwater emergent and scrub-shrub marshes found in river deltas and rice fields (Jenkins 1989; USFWS 1990b).

Coastal pothole wetlands are circular to elliptical, shallow, wind-deflated depressions and basins varying from 0.1 to greater than five acres in size that extend southward along the coast from Matagorda Bay to southern Cameron County. Potholes occurring in the Lower Rio Grande Valley (Cameron and Willacy counties) are found in high clay content soil and are classified as palustrine wetlands, while the pothole wetlands found from Matagorda Bay south to Baffin Bay in sandy soils with live oak brush are classified as palustrine open-water and emergent type wetlands (Jenkins 1989; USFWS 1990b).

An inventory of the Texas Gulf Coast wetlands has been compiled by the National Oceanic and Atmospheric Administration (NOAA) which lists the acreage of coastal wetlands by county within the study area (Table 31). In addition, the Bureau of Economic Geology has prepared a series of atlases that focus on the submerged lands and coastal wetlands of Texas from Sabine Lake (Orange County) to the Lower Rio Grande. Wetlands maps are based primarily on photographic analysis (stereoscopic, color-infrared, 1:66,000-scale positive transparencies taken in November 1979 by NASA) supported by field data. The atlases of Beaumont-Port Arthur, Galveston-Houston, Bay City-Freepoint, Port Lavaca, Corpus Christi, Kingsville, and Brownsville-Harlingen provide the mapped wetlands and associated environments found within the coastal areas of the study area. The USEPA also conducted a study which showed the proximity of Texas sanitary landfills (119) to wetlands (mainly estuarine or riverine) along the Texas Gulf Coast utilizing USFWS National Wetlands Inventory (NWI) maps, while the TWC prepared a Coastal Region Spill Response Map Series which also illustrated wetland areas. The Bureau of Economic Geology and the USFW provided wetland field descriptions and interpretations of aerial photographs for 30 7.5-minute quadrangles of Galveston Bay (White et al. 1983, 1985, 1986, 1987, 1988, 1989a, 1989b; Lambou 1990 et al.; Field et al. 1991; TWC 1992b; White and Payne 1992).

#### 2.6.3.2 List of Priority and Candidate Wetlands

Priority wetland sites have been evaluated through the wetlands assessment threshold criteria (i.e., historic losses, threats of future losses, functions and values) of the National Wetlands Priority Conservation Plan (NWPCP). They are eligible for acquisition through the Land Acquisition Priority System (LAPS) under the Emergency Wetland Resources Act of 1986 (P.L. 99-645). Candidate wetland sites have not been evaluated through the threshold criteria and may be added to the acquisition list, but only after they have been evaluated through the threshold criteria. Region 2 of the USFWS has compiled a list of priority (Table 32) and candidate wetland sites (Table 33) (USFWS 1990b).

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Table 31 - Coastal Wetland Acreage by County in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Coast/ Counties	Wetland Areas (Acres x 100)				Total
	Salt Marsh	Fresh Marsh	Forested and Scrub-Shrub	Tidal Flats	
UPPER COAST					
Orange	31	83	76	-	190
Jefferson	629	888	121	44	1,682
Chambers	459	256	80	28	823
Harris	12	86	39	8	145
Galveston	351	37	7	80	475
Fort Bend	-	43	89	-	132
Brazoria	536	274	205	41	1,056
Wharton	-	37	18	-	55
Matagorda	563	206	57	87	913
Jackson	105	44	41	5	195
CENTRAL COAST					
Victoria	15	150	157	1	323
Calhoun	338	275	28	50	691
Refugio	112	313	86	21	532
Aransas	254	186	10	109	559
San Patricio	120	59	11	40	230
Nueces	52	94	16	81	243
Kleberg	47	468	5	148	668
LOWER COAST					
Kenedy	244	921	47	1,120	2,332
Willacy	139	260	21	358	778
Cameron	<u>312</u>	<u>198</u>	<u>17</u>	<u>531</u>	<u>1,058</u>
Totals	4,319	4,878	1,131	2,753	13,080

Source: Field et al. 1991

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Table 32 - Texas Priority Wetlands for Acquisition Consideration in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Site Name	Counties	USGS Quad(s)	Estimated Acreage
Blue Elbow	Orange	Orange, LA, Echo	5,320
Delhomme Marsh	Chambers	Cove	2,176
Middleton Marsh	Chambers	High Island, Stanolind	3,670
Horseshoe Marsh	Chambers	High Island	1,029
Robinson Bayou Marsh	Chambers	Frozen Point, Lake Stephenson	13,300
Lower Marsh	Chambers	High Island	5,200
Pierce Marsh	Galveston	Virginia Point	1,361
Freshwater Lake	Brazoria	Freeport	1,100
Hoskins Mound	Brazoria	Christmas Point, Danbury, Hoskins Mound, Oyster Creek	32,000
Smith Marsh	Matagorda	Cedar Lake West	3,100
Baer Ranch	Matagorda	Matagorda, Wadsworth	4,500
Rancho La Bahia	Calhoun	Seadrift NE, Port Lavaca East	3,764
Welder Flats Marsh	Calhoun	Long Island Mosquito Point	3,800
Guadalupe River Delta	Calhoun, Refugio	Austwell	12,000
Lamar Peninsula	Aransas	St. Charles Bay	3,727
McC Campbell's Slough	Aransas San Patricio	Aransas Pass	2,440
Playa del Rio	Cameron	Port Isabel, Palmito Hill,	12,300
<u>Mouth of the Rio Grande</u>			
Total			108,591

Source: USFWS 1990b

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Table 33 - Texas Candidate Wetlands for Acquisition Consideration in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Site Name *	Counties	USGS Quad(s)	Estimated Acreage
North Orange County Bottoms	Orange	Echo	1,706 <sup>a,b</sup>
Wilson Preserve	Jefferson	Pine Forest	43 <sup>c</sup>
Giant Palmetto	Jefferson	Sour Lake	10,982 <sup>a,b,d</sup>
Sabine Ranch	Jefferson	Star Lake,	11,700
		Alligator Hole Marsh	
Spindletop Marsh	Jefferson	White's Ranch,	21,200 <sup>b</sup>
		Star Lake	
White's Ranch	Chambers,	Mud Lake,	100,000 <sup>b</sup>
	Jefferson	White's Ranch	
Laura Jackson Howe	Chambers	Frozen Point,	750
		Oyster Bayou	
Ralph Jackson	Chambers	Frozen Point	53 <sup>c</sup>
Big Pasture Bayou Marsh	Galveston	Frozen Point,	4,500
		Caplan	
Bolivar Flats	Galveston	Flake, Jetties	900
Pierce Marsh	Galveston	Virginia Point	1,361 <sup>c</sup>
Halls Bayou Marsh	Brazoria,	Sea Isle, Hitchcock	13,745 <sup>e</sup>
	Galveston		
Mad Island Marsh	Matagorda	Palacious NE	6,500 <sup>c,e</sup>
Mad Island Lake Addition	Matagorda	Palacious NE,	1,000 <sup>e</sup>
		Palacious Point	
Green Lake	Calhoun	Green Lake, Austwell	12,090 <sup>c</sup>
Swan Lake Marsh	Jackson,	Lolita, Point Comfort	5,244 <sup>c,f,g</sup>
	Calhoun		
Mission Bay Marsh	Aransas	Mission Bay	1,500 <sup>c</sup>
San Jose Island Marshes	Aransas	St. Charles Bay,	24,700 <sup>b,c,f,g,h</sup>
		St. Charles Bay SE,	
		St. Charles Bay SW,	
		Esk's Allyn's Bright,	
		Port Aransas	
Port Bay and Swan Lake Marshes	Aransas ,	Aransas Pass	4,126 <sup>c,f,g</sup>
	Bayside		
Taft Drainage Ditch	San Patricio	Bayside	1,730 <sup>c,i</sup>
McGregor Ranch	San Patricio	Odem, Annville	13,103 <sup>c,f,g</sup>
Held Tract	Nueces	Oso Creek, NE	45 <sup>c,j</sup>
Backside of Mustang Island	Nueces	Crane Islands SW,	12,247 <sup>c,k</sup>
Port Aransas		Crane Islands NW,	
Laguna Larga	Nueces,	South Bird Island NW,	9,092 <sup>h,l</sup>
	Kleberg	Chapman Ranch,	
		Pita Island	
King Ranch	Nueces, Kleberg,		88,865 <sup>f,g,m</sup>
et al. Complex	Kenedy, Willacy		
Brackish Wetlands	North Cameron	Hawk Island,	ND <sup>n</sup>
	Willacy,	La Leona, Port Mansfield,	
		Willamar	
Buena Vista Ranch	Cameron	La Coma, Three Islands	5,954 <sup>o,p</sup>

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Table 33 - Texas Candidate Wetlands for Acquisition Consideration in the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Site Name *	Counties	USGS Quad(s)	Estimated Acreage
South Padre Island Marshes	Cameron	North of Port Isabel, SW Port Isabel, NW South Padre Island	ND <sup>c</sup>
Cameron County Resacas	Cameron	Palmetto Hill, East Brownsville, West Brownsville, Southmost, Los Fresnos, Olmito, La Paloma, Santa Maria, Progreso, Laguna Vista, Laguna Atascosa, Rio Hondo, Harlingen, La Feria	ND <sup>n</sup>
Total			353,136

\* All wetland sites have a NWI Classification except for the King Ranch et al. complex

Legend: NWI=National Wetland Inventory; USEPA=U.S. Environmental Park Service; USFWS=U.S. Fish Wildlife Service; USDA=U.S. Department of Agriculture; TPWD=Texas Parks and Wildlife Department; NWR=National Wildlife Refuge; NPS=National Park Service; USGS=U.S. Geological Survey; ND=No Data

- <sup>a</sup> Proposed for Acquisition Consideration in the Texas Bottom Land Hardwood Preservation Program
- <sup>b</sup> Listed by the Texas Natural Heritage Program
- <sup>c</sup> Texas Nature Conservancy
- <sup>d</sup> Listed by USEPA as a priority waterbody/wetlands
- <sup>e</sup> Identified as priority preservation sites under the North American Waterfowl Management Plan
- <sup>f</sup> USFWS-Category 8-Texas Gulf Coast-Wetland Preservation Program
- <sup>g</sup> USFWS-Category 5-Texas Gulf Coast-Land Protection Plan
- <sup>h</sup> USFWS-Unique Wildlife Ecosystem of Texas
- <sup>i</sup> USDA-Soil Conservation Service
- <sup>j</sup> Laguna Madre-Initiative-North American Waterfowl Management Plan
- <sup>k</sup> Audubon-Texas Sanctuary Manager
- <sup>l</sup> TPWD-Resource Protection Division
- <sup>m</sup> Texas Mid-Coast Initiative-North American Waterfowl Management Plan
- <sup>n</sup> Lower Rio Grande Valley NWR
- <sup>o</sup> Laguna Atascosa NWR
- <sup>p</sup> NPS-Potential Natural Landmarks of the Western Gulf Coast

Source: USFWS 1990b

### 3.0 Socioeconomic Conditions

The following sections present baseline socioeconomic data for the Texas Gulf Coast study area. The counties included in this analysis (listed east to west) are: Orange, Jefferson, Chambers, Harris, Galveston, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. Socioeconomic data discussed include population, racial and ethnic distribution, population density, housing, employment, and income.

#### 3.1 Population

Population in the study area as of 1997 was estimated to be 5,280,971 with 60 percent of the population living in Harris County (Table 34). This is an increase of 13.3 percent from the 1990 population of 4,660,368. The population grew 14 percent during the 1980s with most of the increase occurring in Harris County (Houston metropolitan area). Four

counties are estimated to have had a population decline between 1990 and 1997; Matagorda, Refugio, Kleberg and Kenedy. Population density varies from a low of 0.3 persons per square mile in Kenedy County to a high of 1,826 in Harris County. The main population base is in the easternmost counties of Orange, Jefferson, Harris, Galveston, and Fort Bend. Moving southwest down the coast, there are a series of sparsely populated, mostly rural counties until reaching a substantial population in the Corpus Christi area (Nueces County). Continuing south, the area again becomes rural and sparsely populated until reaching the southernmost county of Cameron on the U.S.-Mexican border.

The largest segment of the population is non-Hispanic caucasians followed by Hispanics. These two groups make up 81 percent of the population. African-Americans make up 16 percent of the population. A substantial Asian population resides within the study area with most living in Harris County. While there are substantial Hispanic populations in all counties except the easternmost (Orange, Jefferson, and Chambers), the highest concentration of Hispanics is found in the counties from San Patricio southwest to Cameron. Hispanics make up sizable majorities in several of these counties.

The study area contains one major metropolitan area, Houston in Harris County, and one substantial city, Corpus Christi in Nueces County (Table 35). Beaumont, Port Arthur, Baytown, and Galveston in the eastern area of the study area contain more than 50,000 residents. Victoria in the central area and Brownsville in Cameron County also have populations above 50,000. The study area also contains a number of smaller cities and towns.

### 3.2 Housing

Housing data from the 1990 Census is the latest available at the county level. The study area contains 1.9 million housing units as of 1990 with 62 percent in Harris County (Table 36). Vacancy rates are generally lower in the eastern portion of the study area and highest in the areas closer to the U.S.-Mexican border. Vacancy rates average 13 percent for the study area. The lowest vacancy rate is found in Fort Bend County (nine percent) and the highest in Aransas County (34 percent).

The housing markets vary extensively with the highest home values and rental rates found in the counties making up the Houston metropolitan area and Aransas, Victoria, Matagorda, and Nueces counties in the central area. Lower values and rents are found in the southernmost counties near the Mexican border.

### 3.3 Employment

Employment in the Texas Gulf Coast counties totaled 2,551,655 in 1997 with 64 percent of the employment in Harris County. Unemployment averaged 7.9 percent in 1997 for the 20 counties (combined), which was similar to the national average (Table 37). Rates vary from a low of 3.2 percent in Fort Bend County to a high of 22.1 percent in Willacy County. Unemployment in most counties is between five and eight percent.

The region has a diverse economic base with strong services, manufacturing, construction, and transportation sectors. The manufacturing sector has substantial employment in petroleum and chemical sectors. This sector is closely tied to waterborne commerce (international and inland). Trade (retail and wholesale) employment is also important to the regional economy. Agriculture and fisheries are also a relatively important economic sector though they do not account for a large percentage of overall employment.

### 3.4 Income

Income distribution is also dominated by the manufacturing, services, and construction sectors. The petroleum and chemical industry generates high per capita incomes for its employees. Trade and finance are additional significant sources of income.

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Table 34 - Demographic Information for Counties (1997) in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Population	Land Area (sq. miles)	Density (per sq. mile)	Race					
				Caucasian	African- American	Native American	Asian	Other	Hispanic
Orange	84,648	356.4	237.5	74,799	7,080	191	502	43	2,032
Jefferson	241,940	903.6	267.8	148,898	74,563	531	4,990	195	12,763
Chambers	23,545	599.4	39.3	18,953	2,977	57	132	25	1,401
Harris	3,158,095	1,729.00	1826.5	1,712,415	591,640	6,884	119,151	5,286	722,719
Galveston	242,979	398.7	609.4	161,645	41,867	756	3,802	253	34,656
Fort Bend	321,149	875	367.0	172,733	65,076	586	19,914	309	62,531
Brazoria	225,406	1,386.90	162.5	164,237	18,136	808	2,160	327	39,738
Wharton	40,146	1,090.20	36.8	23,614	6,195	17	103	65	10,151
Matagorda	37,910	1,114.50	34.0	22,460	5,164	76	819	62	9,330
Jackson	13,656	829.5	16.5	9,475	1,252	14	12	1	2,903
Victoria	82,024	882.6	92.9	48,352	5,116	156	248	165	27,987
Calhoun	20,806	512.4	40.6	12,035	592	34	598	20	7,527
Refugio	7,882	770.3	10.2	4,132	601	12	5	6	3,127
Aransas	22,579	252	89.6	16,792	380	120	724	35	4,528
San Patricio	69,626	691.8	100.6	32,795	1,021	176	132	171	35,331
Nueces	317,474	831.9	381.6	134,904	13,026	879	2,245	618	165,801
Kleberg	30,216	871.1	34.7	10,259	953	49	380	81	18,494
Kenedy	427	1,456.90	0.3	86	0	0	0	5	336
Willacy	19,662	596.7	33.0	2,941	81	9	12	31	16,588
Cameron	<u>320,801</u>	<u>905.6</u>	<u>354.2</u>	<u>55,934</u>	<u>699</u>	<u>227</u>	<u>742</u>	<u>516</u>	<u>262,683</u>
Totals	5,280,971	17,055	4,735	2,827,459	836,419	11,582	156,671	8,214	1,440,626

Source: U.S. Department of Commerce 1998

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Table 35 - Population of Major Cities and Towns for Counties (1990 and 1996) in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	City	1990 Population	1996 Population Estimates
Orange	Orange	19,381	18,953
Jefferson	Beaumont	114,323	111,224
	Port Arthur	48,056	57,701
Harris	Baytown	61,124	68,156
	Houston	1,596,779	1,744,058
Galveston	Galveston	59,070	60,048
	League City	30,026	40,631
	Texas City	40,822	42,368
Fort Bend	Rosenberg	20,183	26,442
	Houston	27,027	27,027
	Missouri City	32,219	55,958
	Sugar Land	24,479	47,810
Brazoria	Lake Jackson	22,331	25,774
	Alvin	19,220	20,579
Wharton	El Campo	10,511	10,654
Matagorda	Bay City	18,170	18,705
Victoria	Victoria	55,076	61,059
Calhoun	Port Lavaca	10,886	11,946
San Patricio	Portland	12,224	13,584
Nueces	Corpus Christi	257,453	280,260
	Robstown	12,832	13,349
Kleberg	Kingsville	25,276	25,375
Cameron	Brownsville	98,962	132,091
	Harlingen	48,735	56,893
	San Benito	20,125	23,047

Source: U.S. Department of Commerce 1991 and U.S. Bureau of the Census 1997

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Table 36 - Housing Data for Counties (1990) in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Housing Units			Percent Occupied	Median Value(\$)	Median Rent(\$)
	Number of Units	Occupied	Vacant			
Orange	32,032	29,025	3,007	90.6%	44,400	254
Jefferson	101,289	90,520	10,769	89.4%	41,800	268
Chambers	8,061	6,930	1,131	86.0%	57,000	266
Harris	1,173,808	1,026,448	147,360	87.4%	63,500	339
Galveston	99,451	81,451	18,000	81.9%	59,700	322
Fort Bend	77,075	70,424	6,651	91.4%	71,600	401
Brazoria	74,504	64,019	10,485	85.9%	61,800	313
Wharton	16,277	14,210	2,067	87.3%	49,300	227
Matagorda	18,540	13,164	5,376	71.0%	53,000	269
Jackson	5,841	4,883	1,008	83.6%	42,000	197
Victoria	29,162	26,228	2,934	89.9%	54,700	276
Calhoun	9,559	6,777	2,782	70.9%	45,000	249
Refugio	3,739	2,937	802	78.6%	39,300	193
Aransas	10,889	6,938	3,951	63.7%	56,700	278
San Patricio	22,126	18,776	3,350	84.9%	47,000	254
Nueces	114,326	99,740	14,586	87.2%	54,700	300
Kleberg	12,008	10,058	1,950	83.8%	40,800	273
Kenedy	213	145	68	68.1%	22,500	135
Willacy	6,072	5,049	1,023	83.2%	25,800	155
Cameron	<u>88,759</u>	<u>73,278</u>	<u>15,481</u>	<u>82.6%</u>	<u>38,400</u>	<u>235</u>
Totals/ Average	1,903,731	1,651,000	197,403	86.7%	48,450	242

Source: U.S. Department of Commerce 1991

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Table 37 - Employment and Unemployment Figures for Counties (1997 Annual Average) in the Gulf Coastal Plains  
Province  
(Texas Gulf Coast)

County	Employment	Unemployment	
		Number	Rate (%)
Orange	37,158	4,114	10.0
Jefferson	108,377	8,746	7.50
Chambers	10,727	607	5.40
Harris	1,624,595	89,524	5.40
Galveston	114,746	10,177	8.10
Fort Bend	163,940	5,246	3.20
Brazoria	97,828	7,724	7.30
Wharton	17,961	1,175	6.10
Matagorda	14,218	2,250	13.70
Jackson	8,892	342	3.70
Victoria	40,892	2,166	5.00
Calhoun	8,284	805	8.90
Refugio	2,835	182	6.00
Aransas	8,896	616	6.50
San Patricio	26,887	2,370	8.10
Nueces	136,713	11,512	7.80
Kleberg	12,254	852	6.50
Kenedy	221	9	3.90
Willacy	5,797	1,640	22.10
Cameron	<u>110,434</u>	<u>15,855</u>	<u>12.60</u>
Totals	2,551,655	165,912	7.89

Source: Texas Workforce Commission 1998

#### 4.0 Cultural Resources

##### 4.1 Geographical/Environmental Setting

The Texas Gulf Coastal Plain is adjacent to and within several cultural areas including the Lower Mississippi Valley, Trans-Mississippi South, and Southeast/Southern Texas Coastal Plain. Natural environments range from the lower drainages of rivers and adjacent coastal prairies to a shore zone consisting of wetlands and barrier beaches. During the late Pleistocene, the lowering of the sea level advanced the development of deltaic plains on the continental shelf and caused the incision of major river valleys further inland. Since then, alluvial infilling has buried these ancient valleys and a transgressive shoreline, dominated by barrier islands formed during the mid-Holocene, has protected much of the former subaerial surface from erosional shoreline forces.

##### 4.2 Site Locations

Within the Texas Gulf Coast Plain, prehistoric occupations occur mainly as open-air sites situated on either Holocene alluvial terraces adjacent to streams and rivers, or on the broad upland remnants of Pleistocene alluvial terraces (Black 1989). Site locations in the interior zone appear primarily in a savanna or coastal plain environment and were occupied for shorter periods of time in comparison to those farther north in central Texas where permanent sources of water were more abundant (Hester 1981; Black 1989).

The essential factor resulting in the shorter period of site occupation was the diminished availability of food resources from east to west along the Texas Gulf Coast Plain. Once outside the permanent water of the riparian zones, the inventory of available fauna and flora dropped off dramatically. In the context of this low density resource environment, groups farther to the west had to be more mobile in order to gather adequate food resources.

Along the coast, archeological sites are found associated with the complex coastal network of estuaries and bays. Based on a maritime adaptation, sites and artifacts within this area are markedly different than those of the interior savanna and coastal plains (Hester 1981, 1989; Black 1989). The coastal sites occur mainly along the protected estuaries and bays where abundant marine resources were exploited in this low energy environment. The proximity of the interior savannas to the coastal strip has been suggested as an additional source of food for the coastal oriented groups especially on a seasonal basis when populations may have moved between the two areas (Hester 1981). The archeological documentation of this patterning has proved elusive, however, and the exact relationships between the inland and coastal regions are at this time still unknown (Collins and Bousman 1990).

##### 4.3 Types of Sites

A wide range of both prehistoric and historic sites exists in the Texas Gulf Coastal Plain. The number of listed National Register Sites and State Archeological Landmarks (Appendix L) varies widely from county to county (Table 38), due to the number of projects completed in the counties rather than the actual number of significant sites and landmarks that may exist there. Historic buildings comprise the majority of the National Register sites in the Texas Gulf Coastal Plain. Historic site types include forts, shipwrecks, plantations, lighthouses, depots, battlefields, battlefield cemeteries, towns, ranches, homesteads, churches, and trading posts.

The types of prehistoric sites differ significantly between the interior and coastal areas. The primary site type found in the interior portions of the study area is the thin deposit, open-air site. The lack of soil development, coupled with erosion and land clearing, has resulted in a great number of these sites being left exposed and unprotected on present-day surfaces. Due to the lack of soil development, often compounded by deflation and a shorter occupation span, there are very few stratified sites within the Texas Gulf Coastal Plain area. Indeed, it is not unusual to find a site with mixed surface deposits dating from the late Paleo-Indian period through the Late Archaic and Late Prehistoric periods.

Table 38 - Number of Recorded Archeological Sites by County within the Gulf Coastal Plains Province  
(Texas Gulf Coast)

County	Site Frequency
Orange	87
Jefferson	72
Chambers	363
Harris	828
Galveston	146
Fort Bend	268
Brazoria	201
Wharton	95
Matagorda	116
Jackson	189
Victoria	135
Calhoun	92
Refugio	24
Aransas	92
San Patricio	197
Nueces	285
Kleberg	93
Kenedy	23
Willacy	151
Cameron	<u>178</u>
Totals	3,635

Source: Site files at Texas Archeological Research Laboratory,  
University of Texas at Austin, as of December 2, 1998

The artifact inventory found within these sites consists mainly of chert debris, broken chert tools, fragmented burned rock, and freshwater and marine shells (Black 1989). Sites that have an Early Ceramic or Late Ceramic/Late Prehistoric component contain ceramics as well as the other artifacts. In conjunction with the lack of stratification, the presence of subsurface features such as hearths, pits, and caches are rare.

Although sites within the major river valleys can occur in various locations and may vary more in character than those situated farther inland, these sites tend to be concentrated within the riparian zones. In these areas, there is some evidence for specialization between larger campsites closest to the drainages and foraging sites farther away from the perennial streams (Hester 1981; Bousman et al. 1990). Quarry workshops along gravel outcrops also have been documented in association with this kind of settlement pattern (Hester 1981).

Within the wetland regions of the coast itself, shell middens and dune occupations are the dominant site types. Shell middens occur mainly on the margins of the protected estuary bays within the range of brackish to saltwater, suggesting that the placement of these sites was determined by the presence of desired saltwater species.

Shell middens consist of various sized mounds of processed and/or utilized marine shells, mostly composed of oysters, clams, and whelk, that either can represent the site itself or a feature within a larger occupation area. Artifacts found within the shell middens include projectile points, shell artifacts, bone tools and ornaments, triangular bifaces, heavy bifaces, unifaces, tubular stone pipes, ground stone fragments, and ceramics (Hester 1969).

Clay dunes represent another site type characterized by small rises along the bays and associated drainages (Hester 1980). The clay dunes are composed of accumulations of fine, windblown sediments, which on the downwind side, have been scoured out. The scoured depressions are usually filled with water derived from seasonal rains, while the adjacent dunes provide an elevated area ideal for camping. The location of the clay dunes near freshwater creeks that flow into estuary systems also provides an optimal area for hunting, fishing, and fowling. The dunes are also situated near the coastal prairies that were rich in game during the prehistoric era.

The material inventory from clay dunes is comparable to that recovered from shell middens. Burials have been found in clay dunes in the form of individual interments and large cemeteries (Hester 1980).

#### 4.4 A Brief History of Previous Investigations

The first systematic archeological investigations in the Texas Gulf Coastal area were undertaken by H.J. Simmons who conducted limited surveys in the Galveston Bay area. In the same area, J.E. Pearce did archeological work in the 1920s (1932a, 1932b). Other excavations were conducted along the Upper Texas Coast by the University of Texas in the early 1930s at the Capler site, which was later reported in detail by T.N. Campbell (1957).

In the early 1950s, the Addicks Reservoir project, directed by J.B. Wheat, was a portent of things to come in its use of the now-familiar three phase mitigation system (survey, testing, and excavation). This project involved the recording and excavation of a number of sites (Wheat 1953) that, as a whole, were instrumental in the development of a regional sequence for the Texas Gulf Coastal Plain area. Archeological investigations conducted by T.N. Campbell along the Coastal Bend area (Campbell 1947) further expanded the Texas Gulf Coastal Plain prehistoric sequence into areas farther south.

In the Rio Grande Delta, A.E. Anderson (1932) wrote a brief of his work. His collection and notes are now housed at the Texas Archaeological Research Laboratory (TARL) in Austin. Later, R.S. MacNeish (1947) published a preliminary report on an archeological survey of coastal and inland Tamaulipas and a small adjacent area of Texas. In this report, the Archaic and the subsequent Brownsville culture were described.

An *Introductory Handbook of Texas Archaeology* (Suhm et al. 1954) provided an overall summary of temporal units, cultural complexes, and illustrated artifact types for the whole of the Texas Gulf Coastal area. This work was later modified and published as the *Handbook of Texas Archaeology: Type Descriptions* (Suhm and Jelks 1962). As Black (1989) points out, while parts of the Handbook have been refined and modified, most of the terminology, as well as artifact types and descriptions, remain in use today.

With the onset of salvage archeology in the late 1950s and early 1960s and the recognition of Cultural Resource Management (CRM) as a viable subfield in the early 1970s, work in the Texas Gulf Coastal Plain area, and Texas as a whole, grew enormously. Projects by the Texas Archaeological Salvage Project through the University of Texas were conducted at the Wallisville Reservoir and Lake Conroe (Shafer 1966, 1968). In 1967, the presidio at San Augustin de Ahumada (est. 1756) was excavated by C.D. Tunnel and J.R. Ambler through the Texas State Building Commission (Tunnel and Ambler 1967). In the late 1960s and into the 1970s, L.E. Aten and others began archeological investigations on a number of sites in the Upper Texas Coast area (Aten 1967, 1971; Aten and Bollich 1969; Aten et al. 1976). Excavations at sites such as the Harris County Boys School Cemetery provided detailed chronological sequences for the Upper Texas Coastal area that were synthesized in Aten's doctoral dissertation (Aten 1979, 1983). More recent work conducted by the Archeological Research Laboratory of Texas A&M at the Alabonson Road site has

elaborated on Aten's model on the prehistory of the Upper Texas Coast (Ensor and Carlson 1991). Overviews of the research and history of investigations conducted in the study area can be found in Hester et al. (1989) and Story et al. (1990).

Within the past five years several Environmental Assessments (EA) have been completed within the Texas Gulf Coast study area and tiered to the 1994 Programmatic Environmental Impact Statement for JTF-6 and INS. In 1998 an environmental assessment was completed evaluating the impacts of a combination of projects (building of stadium lights on poles, repairing and constructing fences along the border, improvements to existing roads and boat ramps, and the establishment of Remote Video Surveillance (RVS) cameras on light poles). As part of this EA an archeological records check was completed for Starr, Hidalgo, and Cameron counties. It was found that 12 sites in Starr county and seven sites in Cameron County Texas were within 1,000 ft of the project area along with a residential historic district. There were no significant impacts to the historic structures by the proposed project (USACE 1998).

#### 4.5 Prehistoric Overview

The prehistoric culture history of the Texas Gulf Coastal Plain involves a vast area where numerous culture groups existed. At the time of European contact, the four major aboriginal linguistic/culture groups existing within the west coastal plain area included the Coahuiltecan, residing along the inland areas of the southern and southeast coastal plain area of Texas; the Karankawa, residing along the littoral region of the southeast coastal plain area of Texas; the Atakapa, residing along the inland and littoral regions of the central and upper coastal plain of Texas, as well as the inland and littoral regions along the Louisiana west coastal plain; and the Southern Caddo, who were residing within the inland coastal plain of Texas and parts of Louisiana north of the Atakapa.

Three other aboriginal groups were also present in the study area: the Tonkawa (unknown linguistic/cultural affiliation), the Lipan Apache (Athapaskan linguistic/cultural affiliation), and the Alabama-Koasati/Creek (Muskogean linguistic/cultural affiliation). However, it is almost certain that the Alabama-Koasati and Lipan Apache entered after the seventeenth century (Sjoberg 1953a, 1953b; Hsu 1969; Hester et al. 1989; Story 1990). The arrival of the Tonkawa in the Gulf Coastal Plain is probably the most enigmatic of these three non-resident groups and it has been suggested that they were originally from somewhere north of the Red River and had crossed into Texas during the first half of the 1600s (Hester et al. 1989). During the Historic period, the Tonkawa probably resided somewhere inland north of the Guadalupe River above the Coahuiltecan and east of the Karankawa (Aten 1983, 40-41). The arrival of the Lipan Apache has been documented more clearly and probably occurred during the latter half of the eighteenth century (Sjoberg 1953b; Tunnel and Newcomb 1969; Hester et al. 1989). Around the San Antonio area (which was originally inhabited by Coahuiltecan groups), the Lipan Apache were a constant menace to the Spanish and missionary neophytes, and had no doubt ranged farther east, reaching the western fringes of the study area south of the Brazos (Tunnel and Newcomb 1969). The Alabama-Koasati (Creek) were migrant Southeastern Native Americans originating in central western Mississippi and central eastern Alabama who entered former Caddoan territories during the early years of the eighteenth century and settled in Texas west of the Sabine River in the study area (Hsu 1969).

It would be an oversimplification to equate tribal affiliation with the four major linguistic/culture groups in the Texas Gulf Coastal Plain area. Scores of tribes were associated with the Coahuiltecan, Karankawa, Atakapa, and Southern Caddo. At times these groups were allied with one another within a single linguistic/culture group and at other times were antagonistic to one another, splitting off into sister tribes, and in some cases, creating entirely new tribal affiliations separate from the parent group (Wyckoff 1974; Aten 1983; Campbell 1988). Nevertheless, it can be said with some certainty that most, if not all, of the aboriginal groups within the Texas Gulf Coastal Plain area were affiliated linguistically with either the Coahuiltecan, Karankawa, Atakapa, or the Southern Caddo.

The ancestors of the Coahuiltecan, Karankawa, Atakapa, and the Southern Caddo of the region can be traced back perhaps a few hundred years prior to European contact before they completely disappear as definable cultural entities and are lost within the remote prehistoric past. Given the problem of linking cultural affiliation to prehistoric groups living within the West Gulf Coastal Plain, it is more useful to divide the prehistory of this region into general periods and to identify specific cultural items or traits which are characteristic of particular archeological groups within these periods. For lack of better criteria (Story 1990), diagnostic artifacts, such as projectile points and ceramic types, can be used to differentiate particular periods and possible archeological cultures. Creating archeological divisions based on

other sets of criteria, such as paleoenvironmental sequences (Aten 1983), is also a viable alternative for the study area. Although these kinds of geomorphic distinctions still need refinement and further research before they can be used with more universal application, this kind of paleoenvironmental approach in the study area and adjacent parts is promising (Ferring 1986; Collins and Bousman 1990).

In order to establish a working cultural sequence in the Texas Gulf Coastal Plain area, it is important to note that the study area straddles three major biogeographic provinces which have in turn influenced societies throughout prehistory. Basically, the study area falls within three biotic provinces: the Tamaulipan, which encompasses all of the study area south of the Guadalupe River; the Texan, which encompasses the middle portion of the study area from the Guadalupe River to just south of Galveston Bay; and Austroriparian, encompassing all of the study area east and north of Galveston Bay (Blair 1950). The relationship between prehistoric societies and these particular biotic provinces cannot be overlooked, for settlement-subsistence patterns were influenced by the major biogeographic provinces.

Two primary culture historic sequences for the Texas Gulf Coastal project area have been recognized. The first sequence, termed the Eastern Chronology, is associated with the archeology of Southeast Texas (Story 1990) and applies to the eastern portion of the study area. This sequence corresponds to the general sociocultural developments associated with the eastern woodlands of North America. The second culture historic sequence, the Western Chronology, is associated with the archeology of South Texas (Black 1989) and applies to the western region of the study area. This sequence corresponds to the general sociocultural developments associated with the semi-arid plains of south Texas and northern Mexico. Both the Eastern and Western chronologies straddle the ecotonal region known as the Texan Biotic Province, incorporating most of the Gulf Coastal Plain and southern reaches of the Post Oak Belt (Arbingast et al. 1979). This province is associated with the prairies and prairie margins consisting of cross timbers and post oak belts, which bridge the Great Plains and Atlantic Woodland Biomes. This middle, ecotonal area along the West Gulf Coastal Plain area has an extremely complicated culture history, probably best described as a border zone between various culture groups throughout prehistory and history and shares various traits from both western and eastern cultural influences.

For simplicity and comparative purposes the study area will be split into two basic archeological zones. The first is the "eastern region," which is associated with the Eastern Chronology and affiliated with the archeology of southeastern Texas and southwestern Louisiana (Jeter et al. 1989; Story 1990). The second is the "western region" that is associated with the Western Chronology and affiliated with the archeology of south Texas (Black 1989). The eastern region encompasses the area from the Brazos River Basin north, while the western region encompasses the area south of the Brazos River Basin.

Before listing the cultural historic sequence, it is important to note that the periods and the dates are presented in a very simplified manner and are only meant to provide a cursory account of the archeological cultures within each period. The prehistory of the Texas Gulf Coastal Plain will be restricted to the pertinent regions within the area and will not incorporate the much broader archeological developments within the West Gulf Coastal Plain as a whole (referring primarily to the inland Gulf Coastal regions north of the study area, such as the Red River Basin, etc.). In the Texas Gulf Coastal area, the Early Ceramic period is basically restricted to the eastern region of the study area and does not apply to the western region. After the Paleo-Indian period, the following Archaic periods appear to have persisted longer in the western region, and at times there is not always a close temporal agreement between the two (Hester 1989; Jeter et al. 1989; Story 1990). One should also note that the Late Prehistoric (used primarily in the western region of the study area) and Late Ceramic period (used in the eastern regions primarily along the Upper Texas Coast) are treated as temporally equivalent period designates.

The Eastern Chronology associated with the eastern region of the study area (Story 1981, 1985, 1990; Thurmond 1985; Brown 1987; Prkryl 1987; Jeter et al. 1989) is as follows:

Paleo-Indian Period	10,000-6000 B.C.
Early Archaic Period	6000-4000 B.C.
Middle Archaic Period	4000-2000 B.C.
Late Archaic Period	2000-200 B.C.
Early Ceramic Period	200 B.C.-A.D. 800
Late Ceramic or Late Prehistoric Period	A.D. 800-1600

The Western Chronology associated with the western region of the study area (Prewitt 1981, 1985; Story 1985; Black 1989) includes:

Paleo-Indian Period	9200-6000 B.C.
Early Archaic Period	6000-2500 B.C.
Middle Archaic Period	3000-400 B.C.
Late Archaic Period	400 B.C. - A.D. 800
Late Prehistoric Period	A.D. 800-1600

#### 4.5.1 Paleo-Indian Period (10,000-6000 B.C.)

The Paleo-Indian period of the Texas Gulf Coastal Plain represents the initial settlement phase of the area when aboriginal groups moved in from the Great Plains during the close of the Pleistocene Epoch and began to adapt to a series of rapidly changing environments. These particular groups of people were undoubtedly of Eurasian origin who migrated across the Bering Strait into North America and were primarily big game hunters dependent on the movements of the large Pleistocene animals roaming the peri-glacial landscape. Although Pleistocene megafauna remains have been found in this region, the Texas Gulf Coastal Plain during this period probably provided a different set of key environmental resources. These resources likely induced early populations to try alternative subsistence strategies which were geared toward the procurement of marine resources, smaller mammals, migratory water fowl, and certain kinds of plant foods. Overall, the climate appears to have been cooler and more moist during this period and it is probable that considerable stands of deciduous forests interspersed with coastal prairies grew along the Texas Gulf Coastal Plain region (Aten 1983). The actual shoreline was considerably farther out in the Gulf and sea level was still below that of today. Indeed, there may have been coastal adaptations during the Paleo-Indian period, however, evidence for such is now submerged along the continental shelf.

The surviving material culture of the Paleo-Indian period consists almost entirely of lithic artifacts characterized by blades, end scrapers, and lanceolate points. Tools are usually well made and are often produced from high quality, non-local materials, suggesting that the people who made them were highly mobile, able to travel extensive distances to procure lithic materials, but at the same time compelled to carefully curate tools for long periods of time when they were far from the desired lithic resources. The most typical artifact of the Paleo-Indian period is the finely flaked, basally ground lanceolate projectile point/knife common throughout North America. Clovis points, which are long, laurel leaf-shaped points with small basal flutes, signify the earliest Paleo-Indian horizon commonly referred to as the Llano horizon (Figure 17). The Folsom horizon, characterized by shorter lanceolate-shaped points with long channel flutes, and the Plano horizon, characterized by a number of non-fluted lanceolate points some of which are stemmed, follow (Figure 17). These particular Paleo-Indian horizons are also associated with different suites of large fauna that are sometimes found in association with diagnostic projectile points. For example, the Llano horizon is often associated with mammoth, camel, sloth, bear, and horse; the Folsom Horizon is often associated with *Bison antiquus*; and the Plano Horizon is associated with modern bison, deer, antelope, and elk.

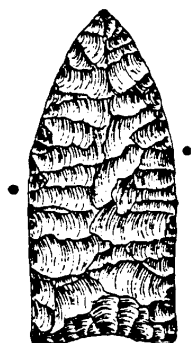
Because the settlement patterns of the Paleo-Indians appear to have been very mobile, it is probable that populations traveled in small microbands across large expanses of territory in order to exploit migrating groups of mammals as well as smaller animals and plant resources situated in particular niches. In the Texas Gulf Coastal Plains in particular, it is quite possible that Paleo-Indian groups traveled from the plains and inland prairies to the coastal river bottoms and marshes to extract different sets of resources just as some protohistoric groups did in the same region thousands of years later (McGraw and Hinds 1987; Campbell 1988).



a (Clovis)



b (Folsom)



c (Plainview)



d (San Patrice)

Sources: Turner and Heister 1985

Figure 17. Illustration of Projectile Points from the Paleo-Indian Period along the Texas Gulf Coast

Few Paleo-Indian sites are located in the study area of the Texas Gulf Coastal Plain relative to other interior regions, such as the Great Plains and Eastern Atlantic Woodlands. This factor may suggest either that the presence of Paleo-Indian groups in this area was limited overall, perhaps due to a rapidly changing and unstable coastal environment, or that sites are buried beneath tons of sediments deposited later during the Holocene period. A few Paleo-Indian sites such as the Doering Site at Addicks Reservoir, the Galena site, McFaddin Beach site, and Crystal Beach site are situated along the lower Trinity and around the Galveston Bay area (Aten 1983; Story 1990). However, these sites, like the few found farther down the southern coast of Texas such as Berger Bluff and Buckner, do not seem to have been very extensively occupied (Sellards 1940; Patterson and Ford 1974; Black 1986, 1989; Brown 1987; Hester 1989).

Both Berger Bluff, which is an inland site located east of Matagorda Bay, and Buckner Ranch, another inland site located 70 kilometers southwest of Berger Bluff, were situated on alluvial terraces but are presently deeply buried underneath tons of more recent Holocene sediments (Black 1989). Unfortunately, there is a paucity of faunal information from these south Texas sites. Some comparative information based on the distribution of Golondrina points, dating around 7080-6830 B.C., suggests that Paleo-Indian groups living in the western region of the study area were associated with the Golondrina Complex. It has been hypothesized that Paleo-Indian groups in the western region of the project area may have had a broad spectrum way of life (Hester 1983; Turner and Hester 1985; Black 1989).

The distribution pattern of San Patrice points extends as far east as southwestern Louisiana (supposedly the core area) and as far west as the Brazos River (Ensor and Carlson 1988). Thus, it appears that at the end of the Paleo-Indian period, there were already some material cultural differences forming between the eastern and western regions of the study area. As it will be pointed out below, San Patrice projectile points (alongside the more northern distribution of Dalton points) signify a transition from a true lanceolate Paleo-Indian point tradition to the more Archaic corner-notched tradition (Story 1990). As a result, some investigators associate San Patrice and Dalton points with either a transitional Paleo-Indian stage or with the Early Archaic period (Coe 1964; Gardner 1974; Sabo et al. 1982; Journey et al. 1989).

#### 4.5.2 The Early Archaic Period (6000-4000 B.C.)

As with the Paleo-Indian period, little is known about the Early Archaic period in the Texas Gulf Coastal Plain area due to a paucity of sites dating to this time period. The number of Early Archaic sites along the Texas Gulf Coastal Plain appears to be less than the number of Paleo-Indian sites of the preceding period (Story 1981). This factor may be due to the drier climate which prevailed much of the time during this period. The coastal zones along the Texas Gulf Coastal Plain appear to have been almost void of Early Archaic populations suggesting that estuaries were too saline due to the drop of fresh river water being discharged into the Gulf to support *Rangia cuneata* in any great number, which in turn would have been a primary food attraction for that area (Aten 1983). It is significant to note that along the Balcones escarpment, where there are a number of springs and other reliable water sources, there is a much higher occurrence of Early Archaic sites than in the Western Gulf Coastal Plain to the south and east (McKinney 1981; Story 1985). This particular settlement phenomenon may signify that there were severe drought conditions occurring within the Gulf Coastal Plain during this time (Story 1990). However, due to recent Holocene alluviation it is equally possible that modern sediments have buried many of these early settlements along the coast (Aten 1983; Black 1989; Story 1990).

The Archaic period in general demarcates the onset of the Holocene period when people began to adapt to modern, post-Pleistocene environments. Overall, groups during the Early Archaic period began to settle into more region-specific areas on a more permanent basis (Aten 1983). Although people had more or less abandoned the mobile habits of their Paleo-Indian ancestors, some groups may have retained their expansive inter-regional ranges (McKinney 1981; Story 1985) and began to adopt a broad spectrum subsistence pattern incorporating a wider variety of food resources. In the Texas Gulf Coastal Plains, the climate during the Early Archaic period appears to have been warmer and drier, which resulted in the significant lowering of water in streams and rivers and caused the prairie biome to expand across wider areas of the coastal plain (Aten 1983).

The material culture of the Early Archaic period was essentially a continuation of the Paleo-Indian tool tradition that was basically a macro flake industry, specializing in the production of finely flaked bifaces. A higher frequency of chipped stone drills, unifacial tools, choppers, different sized hammerstones, ground, pecked, and polished stone is

noted among Early Archaic assemblages. Artifacts were often produced from local lithic resources. Due to the limited extent of lithic resources in the Texas Gulf Coastal Plain, chert river cobbles and silicified wood of inferior quality were utilized more often during the Early Archaic and following periods; and as a result, bipolar methods of core reduction were adopted in response to using smaller materials (Aten 1983). There was also an increase in the manufacture of bone projectile points in some parts of the study area, and the addition of characteristic stone tools such as Clear Fork gouges and Waco sinkers (Hester 1976; Shafer 1977; Story 1981; Aten 1983). Transitional point types such as Dalton and San Patrice, which are found throughout the West Gulf Coastal Plains, signify a change from the traditional lanceolate points of the Paleo-Indian era to the shorter, corner-notched point tradition of the Early Archaic period (Coe 1964; Gardner 1974). From 6000 to 4000 B.C., corner-notched, expanding-stemmed Early Archaic points such as Martindale, Bandy, Uvalde, Palmer, and Kirk (Figure 18) appear in the Texas Gulf Coastal Plains (Black 1989; Story 1990). Tortugas and Abasolo points have been associated with the lower deposits at Addicks Reservoir (Wheat 1953).

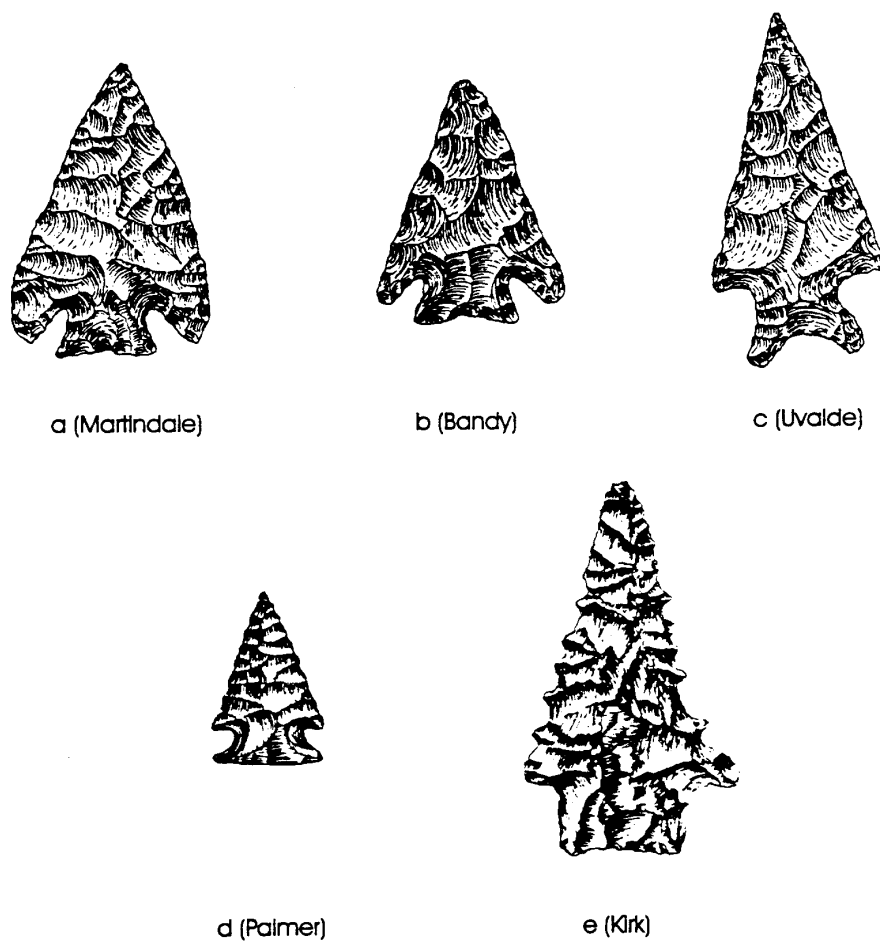
By the Early Archaic period, the three present-day principal habitats within the study area were established (Aten 1983): (1) the coastal zones, including fresh and brackish marshes, strands, and estuaries; (2) the interior deciduous woodlands, including both riparian and upland forests; and (3) the coastal grassland/prairies that are located between the forests and the coastal zone. Since these habitats were readily accessible to Early Archaic populations living within the Texas Gulf Coastal Plain, seasonal-circulatory movements, based on the hunting and gathering of particular food resources at different times during the year, probably induced the splitting and merging of groups. This micro-macro band fluctuation was a common practice among populations within the study area, lasting until European contact. It is of interest to note that during the Early Archaic period, there is no evidence of maritime fishing along the eastern region of the Texas Gulf Coastal Plain, which as a practice, was shunned by aboriginal people throughout the prehistoric and historic periods in this area (Aten 1983).

A similar tripartite habitat mosaic of estuaries, coastal grassland, and some forested areas also existed in the western region. However, instead of deciduous woodlands it is likely that a more widespread savannah zone existed in south Texas during this time. Although it is quite likely that instead of the dense thorny brush that covers much of the south Texas savannah today as the result of overgrazing, there were considerable expanses of grasslands interspersed with oaks and other riparian species situated along the drainages in this region (Doughty 1983; Lehmann 1984; Black 1989). This savannah grassland zone would have supported free-ranging herbivores such as bison, deer, and pronghorn antelope.

Several deeply buried Early Archaic sites are known to be situated in the interior portions of the western region just outside the study area in the Choke Canyon locality along the Frio River (Scott and Fox 1982). Other Early Archaic sites have been located along the coastal area of the western region as well, such as the Swan Lake and McKenzie sites (Prewitt et al. 1986; Ricklis 1986) and 41VT17 (Fox and Hester 1976).

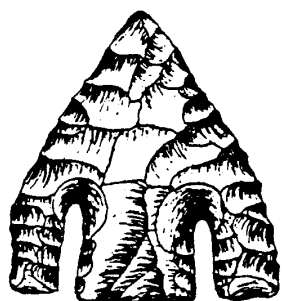
#### 4.5.3 Middle Archaic Period (4000-2000 B.C.)

The Middle Archaic period appears to be a continuation of the Early Archaic way of life. The material culture of the Middle Archaic is basically the same as the Early Archaic except that point styles change (with some exceptions) from corner-notched, expanding-stemmed forms to side-notched or basal-notched, straight-stemmed forms. Examples of Middle Archaic projectile points found in the Texas Gulf Coastal area include Calf Creek (or Andice), Johnson, Morrill, and Carrollton points (Figure 19). Clear Fork gouges and Waco sinkers (Story 1990) persist from the Early Archaic through the Middle Archaic period, as well as the increased use "of stone-lined hearths and baking pits and milling implements" (Story 1990). Shell and bone artifacts apparently were used with increased regularity as well (Campbell 1958; Corbin 1974, 1976).



Source: Turner and Hester 1985 (a-c)  
Bell 1960 (d)  
Pettino 1966 (e)

Figure 18. Illustration of Projectile Points from the Early Archaic Period along the Texas Gulf Coast



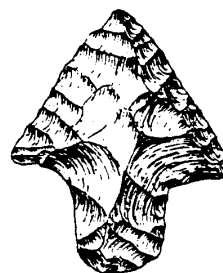
a (Calf Creek)



b (Johnson)



c (Morrell)



d (Carrollton)

Source: Perino 1968 (a)  
Turner and Hester 1985 (b-d)

Figure 19. Illustration of Projectile Points from the Middle Archaic Period along the Texas Gulf Coast

Some researchers (Hall et al. 1986) within the study area believe that there was a fundamental shift toward a heavier reliance on plant resources during this period. Overall, the Middle Archaic period coincides with the beginning of the Sub-Boreal episode which is represented by a more moist and temperate climate and was more conducive to populations living within the Texas Gulf Coastal Plain (Aten 1983).

Middle Archaic populations appear to increase significantly in relation to the Early Archaic period (Black 1989). This can be confirmed by a higher number of sites of this period found as well as the first evidence of cemeteries and territoriality (Walley 1955; Aten et al. 1976; Story 1981, 1990; Hall 1981; Aten 1983). Some of these Middle Archaic cemeteries which show signs of elaborate burial practices can be found along the central and lower Brazos River Valley, the Nueces River Basin, and along the lower Trinity (Walley 1955; Aten et al. 1976, 1983; Hall 1981; Taylor and Highly n.d.).

During this period, populations were extensively exploiting the coastal estuary zones, and as a result, massive shell middens composed mostly of *Rangia cuneata* and *Crassostrea virginica* became a common feature at sites such as the Harris County Boys' School, Johnson, and Ingleside Cove situated along the coastal rim of the Texas Gulf (Campbell 1947, 1956; Story 1968; Scurlock et al. 1974; Highley et al. 1977; Aten 1983). These shell middens appear to have been occupied primarily during the summer months, especially during August, when Middle Archaic populations returned to them on an annual basis (Aten 1972, 1981, 1983; Dillehay 1974, 1975; Skelton 1978; Carlson 1988). Shell middens within the study area are situated all along the coast from the lower Sabine to the Nueces Bay. However, from the Nueces Bay to the Rio Grande Delta, no shell middens exist due to the extensive sand sheets which cover this particular coastal stretch (Black 1989).

Inland areas along the river drainages of the Texas Gulf Coastal Plain were probably also extensively occupied by Middle Archaic people. However, these occupation sites are more difficult to detect due to their less conspicuous nature, as well as being often mixed with later components. Some potentially good inland Middle Archaic sites situated within the Texas Gulf Coastal Plain area include the Addicks Reservoir and Owen sites (Aten 1983). Burned rock middens, which are commonly associated with Middle and Late Archaic sites in central Texas also occur in the study area in a somewhat limited distribution, especially in the western region (Hall et al. 1982; Black 1989). Inland sites of this type suggest that Middle Archaic populations were exploiting nut resources, particularly acorns and walnuts, on a more intensive scale (Weir 1976). Weir's Clear Fork interval, which began during the early part of the Middle Archaic, signifies this particular adaptive strategy in central Texas, and may have extended farther south and east into the interior sector of the western region of the study area, especially where there were stands of hardwood trees along well watered river courses. Indeed, several sites in McMullen County, associated with the Choke Canyon vicinity, have burned rock features which appear to be analogous to the burned rock middens found in Central Texas (Black 1989). The Panther Springs Creek site, which is just west of the study area but situated below the Balcones Escarpment, appears to have a good Clear Fork interval component with charred acorns and walnut shells found in association with deer remains (Black and McGraw 1985).

The dichotomy and distance between burned rock and shell middens in the study area suggest that two primary adaptive strategies, inland and coastal, were practiced during the Middle Archaic period. These two adaptive strategies are very important in terms of regional synthesis within the project area due to the fact that these patterns can be observed in the archeological record subsequent to the Middle Archaic period. Indeed, many of the resident historic culture/linguistic groups occupying the study area can also be differentiated along these lines. Nevertheless, it is known that some tribes did cross back and forth from the coast to the interior (Campbell 1986).

The Loma Sandia site located in Live Oak County is a particularly important inland Middle Archaic site within the western region of the study area. This particular site has a late Middle Archaic cemetery that dates to post 1000 B.C. and Tortugas points, also dated to the Early Archaic period in the eastern region (Wheat 1953). Clear Fork bifaces, also associated with the Early Archaic as well as the Middle and Late Archaic periods but not found in the eastern region, along with ground stone tubular pipes, manos, and metates also have been found at Loma Sandia.

Along the coastal reaches of the western region in San Patricio and Aransas Counties, the Loyola Beach and Oso Creek sites contain late Middle Archaic assemblages. Palmillas, Bulverde, Matamoros, and Morhiss projectile points are

found in association with conch columella gouges and adzes, and incised bone. These artifacts have recently been used to define a coastal cultural manifestation called the Aransas complex (Campbell 1958; Corbin 1974, 1976; Black 1989).

#### 4.5.4 Late Archaic Period (2000-200 B.C.)

The Late Archaic period represents the first sign of major cultural segmentation in the study area. Basically two distinctive adaptive patterns can be recognized in the Texas Gulf Coastal Plain region: the first is associated with the eastern woodlands and prairies of the Austroriparian Biotic Province; the second is associated with the more western semi-arid coastal plain and savannah areas of the Tamaulipan Biotic Province (Blair 1950; Story 1981; Aten 1983). Of course, the ecotonal area of the Texan Biotic Province that comprises much of the central portion of the study area poses special problems on where and to what extent these two primary socio-cultural manifestations influenced one another. However, the Brazos River valley during the Late Archaic period appears to demarcate the general boundary between the western and eastern regions within the study area (Story 1981; Story 1990).

The overall population of Late Archaic groups living within the eastern woodlands and prairies appears to have increased subsequent to the Middle Archaic. This growth apparently restricted group mobility and increased territoriality (Story 1981). Late Archaic groups living within the western coastal plains and savannah enjoyed higher group mobility based on lower population densities; however, food resources were probably more scarce (Story 1981). The complexity of social organization also increased in the eastern region of the West Gulf Coastal Plain, while it stayed more or less the same (band-level, egalitarian societies) in the western region. In the eastern region there are scores of Late Archaic sites throughout all habitats, with a concentration along the major drainages from the interior to the coast. Similar settlement patterns are observed in the western region; however, sites tend to be less intensively occupied and are not nearly as numerous as they are in the east. It is of interest to note that from the beginning of the Late Archaic period, there is a shift in the exploitation pattern of *Rangia cuneata* from the late summer months to the late spring and early summer months (Aten 1983).

Inland settlement patterns and subsistence strategies remained essentially the same from the Middle to the Late Archaic periods within the Texas Gulf Coastal area. Groups congregated into larger units during prime parts of the year and split into smaller foraging bands during the off season. Deer hunts, the harvesting of *Rangia cuneata*, the exploitation of pecans, and the picking of prickly pear probably involved macroband activities, while foraging for various roots and the hunting of small mammals probably took place on the microband level.

However, faunal data from inland sites in the Choke Canyon vicinity in the western region suggest that Late Archaic populations were exploiting a narrower range of animal resources. The lack of large ungulates is noted (Steele 1986a, 1986b). This particular subsistence profile of hunting smaller mammals may reinforce Hall's contention that for the Middle and Late Archaic period, a greater emphasis was placed on the collection of plant foods (Hall et al. 1986). However, it is important that more macrobotanical data be collected from sites dating to this period before this hypothesis can be verified.

Nevertheless, there appears to have been an intensification involving the procurement of food resources during the Late Archaic period in general which may have led to incipient food production or induced the introduction of some early cultigen into the area (Story 1990). The phenomenon of the Gilmore Corridor, which may have served as a conduit for the transport of Mesoamerican cultigens into the greater Southeastern United States, runs directly through the middle portion of the West Gulf Coastal Plain area.

The material culture of the Late Archaic period is a continuation of the overall Archaic tradition. However, there was an increase in the complexity of manufactured items plus indications of interregional trade. Exchange networks originating from the Lower Mississippi Valley at sites such as Poverty Point began to penetrate and influence cultures farther west. Some of this interaction can be observed in the eastern region of the Texas Gulf Coastal Plain through Late Archaic trade items that are present at the Ernest Witte site. Ground and polished implements, such as boat stones, bar gorgets, pendants, and plummets made from imported igneous rocks derived from areas such as southeastern Arkansas and eastern Oklahoma, make their first appearance in the Texas Gulf Coastal area during this period (Wally 1955; Hartman 1963; Long 1977; Patterson and Ford, 1974; Hall 1981; Aten 1983). Generally, projectile points in the Late Archaic period tend to shift from straight-sided stemmed points to tapered stemmed points, the most common of

which is the Gary type (Figure 20) (Johnson 1962). Johnson's La Harpe Aspect that defined a widespread Late Archaic manifestation which stretched from southeastern Oklahoma to the Gulf Coast within the confines of the Texan Biotic Province still has application in the eastern region of the study area as well as other parts of Texas (Ensor and Carlson 1988). Nevertheless, the southern extremes of the La Harpe Aspect that fall within the study area appear to have been more simple in terms of the material culture repertoire than in the more northerly parts (Shafer 1973). However, in the eastern region of the study area, side and corner-notched points with expanding stems, such as Ellis and Palmillas points, are common alongside the more characteristic Late Archaic, tapered stemmed Kent point (Figure 20) (Story 1990). Likewise, in the western region, Ellis and Palmillas points are also common alongside other side and corner-notched types such as Frio, Ensor, Marcos, Fairland, Darl, and Catan (Figure 20) (Black 1989). The last four point types are very common along the coastal zone of the western region and are associated with the Late Archaic phase of the Aransas complex (Corbin 1974).

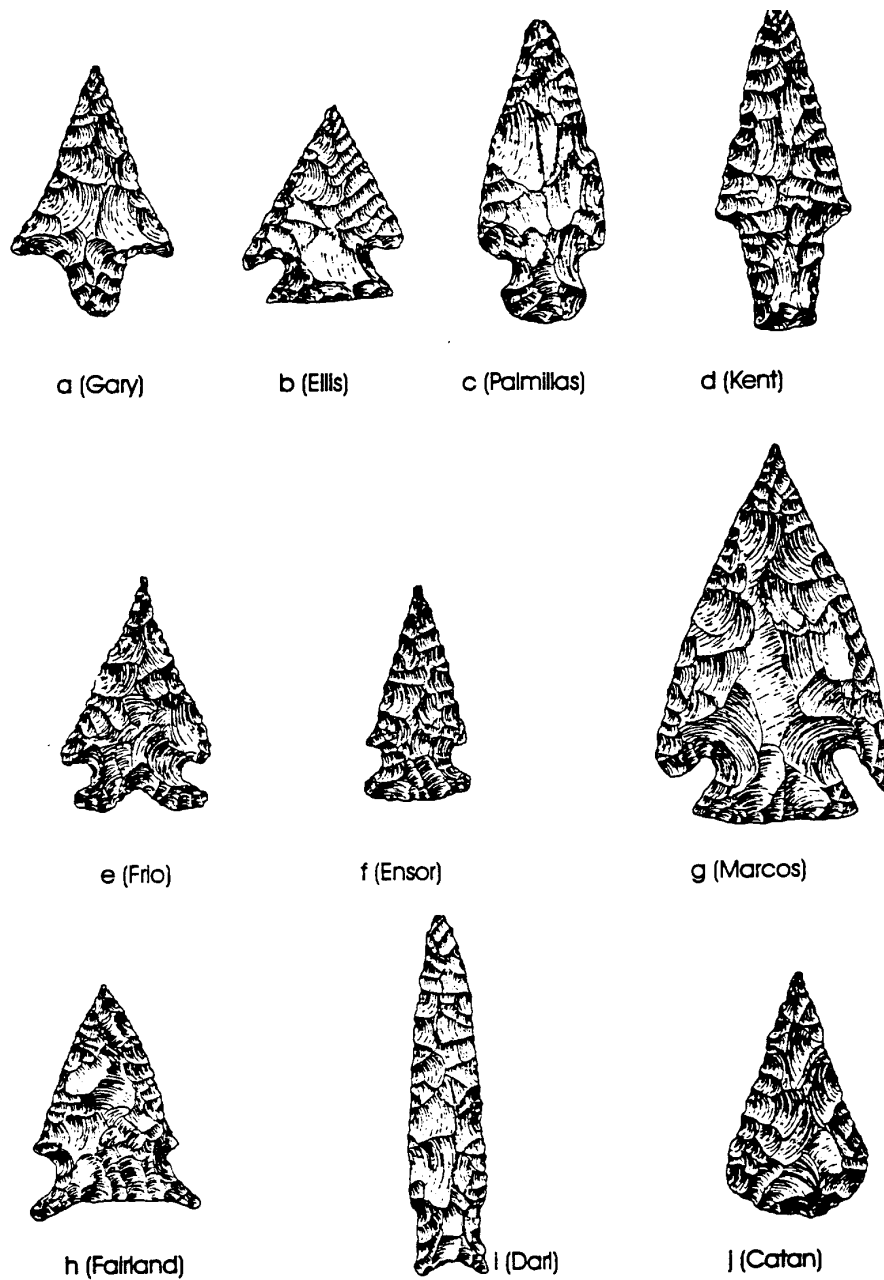
Several significant Late Archaic sites are located within the study area in both regions. In the eastern region, perhaps the most important sites are the Harris County Boys' School and the Ernest Witte sites (Story 1990). The Harris County Boys' School site consists of a coastal shell midden and cemetery situated on the west side of Galveston Bay. This particular site is Aten's "type site" on which he built his precise chronology of the Galveston Bay area which is the most comprehensive chronological sequence of any prehistoric culture(s) in the study area (Aten 1979, 1983; Aten et al. 1976). The Harris County Boys' School site contains both a Late Archaic and an Early Ceramic occupation encompassing all 29 burials found at this site. The site appears to have been seasonally occupied on a continuous basis. Perhaps one of the most important factors concerning this site is that Aten was able to establish a true cultural continuum between resident Late Archaic and Early Ceramic populations (Aten 1979, 1983; Aten et al. 1976). The only real difference Aten found between the two occupations was the ceramic assemblage that was associated with the later period (Aten 1983). It is also important to note that at this site a clear sequence of Late Archaic to Early Ceramic period points was established for the Kent (Late Archaic) and Gary (Early Ceramic) forms (Aten et al. 1976).

Equally significant is the Ernest Witte site that is situated on a bluff overlooking the Brazos floodplain. The site consists of a stratified Late Archaic burial ground containing over 200 inhumations and several cremations (Hall 1981). Dates for the occupation of the site range from 4120 B.P. to A.D. 200. This site may have represented some sort of trade-economic center in the region where exotic goods were redistributed within a larger interregional trade network (Hall 1981). It is interesting to note that by the end of the Late Archaic period, the Ernest Witte site apparently ceased to exist, signifying some sort of regional trade realignment that left this particular area isolated from the developments occurring further to the north and east.

Along the coastal zone within the western region, the Kent Crane, Johnson, and Ingleside Cove sites (Aten 1983) contain a wide range of small mammals, fish, and molluscs (clams and oysters). All of these sites fall within the Aransas complex of the Late Archaic period and persist through the Late Prehistoric period, as represented by the Rockport Complex, where ceramics first appear in the area after A.D. 1200. Like the Harris County Boys' School site, many of these western region coastal sites appear to have had a continuous seasonal occupation from the Late Archaic to the Late Prehistoric period. However, precise chronologies such as Aten's Upper Texas Coast sequences have yet to be established for this part of the study area.

#### 4.5.5 Early Ceramic Period (200 B.C.-A.D. 800)

This particular period pertains only to the eastern region of the Texas Gulf Coastal Plain study area. The Early Ceramic period is defined by the introduction of ceramics into the material culture of the aboriginal populations living in this area. The most important developments of this period were occurring in the easternmost reaches of Texas among the population recognized as the Tchefuncte culture (Ford and Quimby 1945; Griffin 1986; Jeter et al. 1989). The Tchefuncte culture represents a wide-spread cultural phenomenon that extended farther east along the Louisiana Gulf Coast and into the Lower Mississippi Valley (LMV) early in the first millennium B.C. The hallmark of the Tchefuncte culture is the contorted paste ceramics that were usually flat or tetrapodal based, flower pot-shaped vessels.



Source: Turner and Hester 1

Figure 20. Illustration of Projectile Points from the Late Archaic Period along the Texas Gulf Coast

The introduction of ceramics in the Texas Gulf Coastal area must have signified an emphasis on new and novel methods of rendering particular animal and vegetable resources into more economically efficient food products (i.e., extracting oil from nuts; breaking down raw, inedible starchy plants and producing new foods, etc.). Although the technology and cultural make-up of the Tchefuncte culture are an outgrowth of the Late Archaic period, the settlement pattern became more sedentary among these people during the Early Ceramic period.

During the Early Ceramic period, Tchefuncte people and/or influence spread westward along the Gulf Coastal Plain as far as the Upper Texas Coast (Aten 1983). However, in the study area west of the Sabine River, these Early Ceramic cultures were not as prolific as their counterparts farther to the east in Louisiana. Nevertheless, the Early Ceramic period represents an important formative era in which cultures of the West Gulf Coastal area experimented with new concepts of technology and social organization (Story 1981, 1990).

The Tchefuncte culture of the Louisiana coastal plain area contains several important phases that influenced other coastal cultures to the west particularly along the Upper Texas Coast. The first phase is called the Pontchartrain phase and is "distinguished by poorly wedged sandy or sand tempered laminated paste ceramics. Examples include a linear dentated stamped pottery termed Mandeville Stamped, *var. Mandeville*, Tchefuncte Plain...[and] Tchefuncte Stamped, *var. Lewisburg*" (Jeter et al. 1989). Sites associated with this phase are situated in the New Orleans vicinity in southeastern Louisiana and consist mostly of shell middens made almost exclusively of *Rangia* (Phillips 1970; Gagliano 1967). The Grand Lake phase (200 B.C. to A.D. 200) is situated west of the Pontchartrain phase and may have influenced coastal cultures in southeast Texas. The ceramics in this phase tend to be more poorly made and are sandier (Gagliano 1967; Jeter et al. 1989). It is probably during the period from 200 B.C. to A.D. 200 that Tchefuncte cultures and/or influences of the Grand Lake phase spread westward along the Western Gulf Coastal Plain into the Upper Texas Coast (Aten 1983; Weinstein 1986). The Sabine Lake phase of the Tchefuncte culture basically defines the "Texan version" of the Grand Lake phase (Weinstein 1986; Jeter et al. 1989). This phase encompassed an area equidistant between Calcasieu and Sabine Lake to Galveston Bay. Shell midden sites containing lithics and bone artifacts are characteristic of this phase. The distinguishing traits of this phase are the ceramics: O'Neal Plain *var. Conway*, Goose Creek Plain, Tchefuncte Plain, Mandeville Plain, and Goose Creek Plain (Aten 1983; Weinstein 1986). Essentially, Aten's Clear Lake period of the Upper Texas Coast is identical to Weinstein's Grand Lake phase.

Within the study area in southwestern Louisiana, there appears to have been a coastal Marksville culture (A.D. 100-400) which may have extended into Texas (Greengo 1964; Phillips 1970; Toth 1974, 1979; Jeter et al. 1989). However, not much is known about the extent of this culture on the Texas side. Aten's Clear Lake period (A.D. 100-350) in the Galveston Bay and the Brazos Delta area is contemporary with this coastal Marksville culture of Louisiana. However, this period is more closely affiliated with the Sabine Lake phase of the Tchefuncte culture. In the Sabine Lake area of Texas farther to the northeast, the Clear Lake period probably dates earlier than it does at Galveston Bay, suggesting that there was a cultural lag of at least several hundred years from Louisiana to Texas (Aten 1983). Nevertheless, true Marksville traits, such as grog tempered ceramics with deep channel incised decorations, do not appear in the Upper Texas Coast in any significant amount. However, farther to the north on the fringes of the study area along the Sabine River, Marksville traits, including conical, man-made mounds are significant (Jelks 1965). In the Sabine Lake area of the Upper Texas Coast, undecorated grog tempered ceramics (Baytown ?) do reach this area by A.D. 100, but do not spread down the coast to Galveston Bay until A.D. 1000 (Aten 1983).

Following the Clear Lake period, in the Galveston Bay and Brazos area, is the Mayes Island period (A.D. 350-650) which exhibits extremely limited amounts of Lower Mississippi Valley (LMV) ceramics. This period is essentially characterized by Goose Creek Plain and Incised ceramics. Aten's (1983) Mayes Island period may signify a temporary hiatus of Lower Mississippi Valley (LMV) contacts in coastal Texas. It is significant to note that it is just prior to or during this period that the occupation of the Ernest Witte site located farther south on the Brazos River, ceased.

In the Conroe-Livingston area, the Goose Creek ceramic types do not occur until approximately A.D. 540 (Aten 1983). However, upon their introduction, the relative frequencies of particular diagnostic ceramic types correlate well with Aten's coastal Early Ceramic sequence from the Galveston Bay and Brazos River Delta areas (Aten 1983).

Following the Mayes Island period, the Turtle Bay period (A.D. 650-1000 in the Galveston Bay and Brazos Delta areas) in the Upper Texas Coast spans the end of the Early Ceramic period and the beginning of the Late Ceramic (Aten 1983) or Late Prehistoric period. This period is represented by a marked increase in Red Filmed varieties of Goose Creek as well as new styles of Goose Creek Incised (Aten 1983). Contemporary with the Turtle Bay period are the coastal Troyville and Coles Creek cultures within the Lower Mississippi River valley (Jeter et al. 1989).

Another technological innovation, the bow and arrow also appeared during the Early Ceramic period. This technology entered the eastern extremes of the project area between A.D. 500 and 700 and spread west (Aten et al, 1976; Prewitt 1981; Schambach 1982; Aten 1983; Story 1990). It is interesting to note that the introduction of the bow and arrow was subsequent to the advent of ceramics, but spread much faster throughout the study area. The arrow points first dated to the Early Ceramic period in the eastern region of the study area usually consisted of the expanding stem forms of the Scallorn type that inevitably replaced the larger Gary dart points (Figure 21). Strangely enough, Scallorn points are rare in this area overall, while more common arrow points such as Alba and Perdiz seemed to come into vogue a little later (McClurkin 1968; Shafer 1968; Ensor and Carlson 1988).

#### 4.5.6 Late Ceramic-Late Prehistoric Period (A.D. 800-1600)

The Late Ceramic-Late Prehistoric period represents the final episode of the prehistoric era of the West Gulf Coastal Plain. This period portrays a bewildering proliferation of cultural diversity that left an indelible mark on the aboriginal groups who were contacted by Europeans at the onset of the Historic era. In the study area most, if not all, cultures were ceramic producing and were using the bow and arrow. The spread of ceramic technology did not reach the western sector of the study area until hundreds of years after it was introduced in the east. Likewise, the introduction of the bow and arrow probably occurred first in the east. However, some parts of the western region, especially around the Rio Grande Delta, may have acquired early knowledge of the bow and arrow from Mexico. Interestingly, the acquisition of the bow and arrow around A.D. 800 likely occurred prior to the introduction of ceramics in A.D. 1000 in the western region of the study area (Black 1989). The ceramic database provides some of the most essential information in defining and understanding the different cultural facies within this period. The temporal and spatial distribution of arrow point styles in the western region is equally important in delineating cultural influences and change.

In many respects, cultures of the Late Prehistoric-Late Ceramic periods in the West Gulf Coastal Plain area were conservative, retaining much of the Late Archaic lifeways, especially settlement patterns and subsistence strategies (Aten 1983) in relation to the more dynamic developments that were taking place to the north and east just outside the study area. This conservatism was significant and was observed also within the historic tribes living in the area (Newcomb 1961). It is important to note, however, that some significant culture changes were taking place in the western region of the study area. Bison herds moving south into the southern plains may have profoundly affected the lifeways of peoples living in the interior, especially in the western extremes of the study area, while coastal populations retained familiar patterns (Newcomb 1961; Campbell 1988; Black 1989). Perhaps some of the most significant sites (such as Hinojosa, Berclair, and Loyola Beach) in the western region of the study area lie in this dichotomous zone between inland and coastal adaptations (Black 1989)(Figure 23).

In the eastern region, Aten's work along the Upper Texas Coast in the Brazos River Delta, Galveston Bay, Conroe-Livingston, and Sabine Lake area defines the Late Ceramic period (Round Lake through Old River periods - Late Prehistoric) primarily with the introduction of grog tempered ceramics (Aten 1983). However, in the Sabine Lake area, grog tempered ceramics date to the Early Ceramic period suggesting that sites in this region were tied more closely with the LMV than with other sites to the west in the study area. Bone and bone/grog tempered ceramics, along with other decorative traits such as engraving, appeared at the beginning of the Round Lake period (A.D. 1000-1350) and became more common throughout the Old River phase (A.D. 1350-1700). These may be the first signs of true Caddoan traits (Winchell 1990) in the project area. However, along the coastal zones in the eastern region, these particular traits are poorly represented in comparison to the inland Conroe-Livingston area (Aten 1983).



a (Scallom)



b (Alba)



c (Perdiz)

Sources: Turner and Hester 1985

Figure 21. Illustration of Projectile Points from the Early Ceramic Period along the Texas Gulf Coast

The Conroe-Livingston area is an interesting border region where it is likely that prehistoric Caddoan speakers from the north existed alongside Atakapan speakers situated more to the south. Indeed, Story (1990) believes that the inland boundary between the Mossy Grove culture associated with sandy paste ceramics and Atakapan speakers and the Caddoans associated with grog and grog/bone tempered ceramics may have fluctuated back and forth within this area. It is of interest to note that the historic Bidai tribe lived in the vicinity of the Conroe-Livingston region (Aten 1983). Aten feels that the Bidai were Atakapan (Aten 1983); however, it is believed that they were actually Caddoan speakers (Tanner 1974). It is intriguing to speculate that Aten's dilemma involving his Goose Creek bimodality (Aten 1983), in which the relative frequencies of grog tempered ceramics split Aten's Goose Creek Ceramic sequence during the Round Lake and Old River periods, is actually a function of culture/linguistic groups (Atakapa and Caddoans) shifting territorial ranges. It is of additional interest to note that Aten's Late Ceramic sequence of the Brazos River Delta area is very similar to his contemporary Galveston Bay area sequence, even though he assigns different historical tribal affinities to each of these localities: Karankawa to the Brazos River Delta and Atakapan (Akokisa) to the Galveston Bay area.

In the western region along the coastal zone, the Rockport complex, previously associated with the Late Prehistoric and Historic Karankawa, was originally defined as the Rockport focus at the Kent-Crane and Live Oak Point sites by T. N. Campbell (1952, 1958). Like the Upper Texas Coast, there appears to be a continuous, uninterrupted sequence from the preceramic Aransas complex to the Rockport complex which began about A.D. 1200. The Rockport complex has been defined by the characteristic sandy paste ceramics that are often decorated with asphaltum (Suhm and Jelks 1962).

Inland Late Prehistoric sites along the outer fringes of the western region are defined by the presence of either the expanding-stemmed Scallorn or the contracting-stemmed Perdiz arrow points and are associated with two widespread Texas culture complexes termed the Austin (A.D. 800-1350) and Toyah (A.D. 1350-1700) phases, respectively (Black 1986, 1989). Many of these Austin and Toyah phase sites in south Texas have been identified at various sites within the Choke Canyon vicinity (Hall et al. 1986). The presence of undecorated bone tempered ceramics (usually dating to the Toyah Phase and typed as Leon Plain; Suhm and Jelks 1962) are also a key indicator of the Late Ceramic period in this region. Bone tempered ceramics appear in some of these inland sites as early as A.D. 1000.

Perhaps one of the most significant inland Late Prehistoric sites in the western region is the Hinojosa site (Black 1986) situated below the Nueces River in Jim Wells County. This site is probably the most extensive inland Late Prehistoric site within the western region. Perhaps one of the most important finds associated with this site is the highly diversified faunal remains. Forty-five taxa were defined suggesting that Late Prehistoric populations exploited a significantly wider variety of species than they did during the preceding Late Archaic period (Steele 1986a, 1986b). Late Prehistoric sites, such as 41LK201, 41MC222, and 41MC296 in the Choke Canyon vicinity, have also yielded diverse amounts of faunal material (Hester and Hill 1975; Steele 1986a, 1986b; Steele and Hunter 1986).

The little known Brownsville complex represents another Late Prehistoric manifestation situated in the Rio Grande Delta area of the study area. This particular complex is characterized by intricately made projectile points, gouges, and scrapers of shell as well as beautifully made shell ornaments such as gorgets, beads, and pendants (Mason 1935). The Brownsville complex does not contain stemmed projectile points but rather triangular points such as Fresno, Starr, Matamoros, and Cameron types (Figure 22) (Black 1989). Interestingly, Huastecan pottery from the Mexican Gulf Coast has also been recovered from several burials associated with this complex (Mason 1935).

#### 4.5.7 The Protohistoric Period (circa A.D. 1600)

The Protohistoric period of the Gulf Coastal Plain area is the Late Prehistoric period as observed and documented by French and Spanish explorers. Such names as "Coahuiltecan," "Karankawa," "Atakapa," and "Caddo" were the generic labels identifying particular groups of people among the hundreds living in the West Coastal Plains (Swanton 1911; Campbell 1988) during the Late Prehistoric period. Cabeza de Vaca and his associates were the first Europeans to come face to face with Late Prehistoric peoples in the study area in 1538. They probably made contact with Atakapan, Karankawa, Coahuiltecan, and possibly some marginal southern Caddoan speakers.



a (Fresno)



b (Starr)



c (Matamoros)



d (Cameron)

Source: Turner and Hester 1985

Figure 22. Illustration of Projectile Points from the Late Ceramic-  
Late Prehistoric Period along the Texas Gulf Coast

His ethnohistoric accounts are the first real-life glimpses of these people who foraged for prickly pear, hunted bison and deer, picked pecans, ate oysters and clams, and grubbed for roots. Later, in the seventeenth century, other explorers, soldiers, and missionaries, including Mazenet, Varona, Espinosa, and Derbenne-St. Denis, confirmed and elaborated on the initial observations made about the aboriginal populations by Cabeza de Vaca. Recently, it has been discovered that many of these aboriginal people were highly mobile. Apparently these groups traveled from one part of the region to another, moving from lower river courses to areas one hundred or so miles inland (Tunnel and Newcomb 1969; McGraw and Hindes 1987; Campbell 1988). Karankawa and Coahuiltecan bands likely interacted and cooperated in hunting and gathering excursions (Hatcher 1932; Ruecking 1953; Campbell 1988).

What is perhaps most disturbing, and at the same time fascinating, about the Protohistoric period of the West Gulf Coastal Plain area is that assumptions have been made that resident populations had been living there for hundreds, if not thousands of years. Given the extent of travel and the level of integration known to have taken place among various Protohistoric aboriginal groups in the project area, whether the Late Prehistoric archeological cultures were in fact ancestral to the Protohistoric populations encountered by the Europeans is as yet unknown. The earliest documented protohistoric sites within the study area date to the seventeenth century, while the latest confirmed Late Prehistoric sites date somewhere between the twelfth and fourteenth centuries; leaving a gap of at least several hundred years when populations could have moved into and out of the project area (Black 1986; Campbell 1988; Winchell in press).

#### 4.6 Historic Overview

The following brief historic overview of the Texas Gulf Coastal Plain area has been summarized from more extensive works authored by A. Fox (1989), D. Fox (1983), and Freeman (1990). The Historic era can be divided into four principal periods based on the settlement and control of the area by various ethnic groups. The four Historic periods are:

Early French Settlement	A.D. 1685-1820
Spanish Colonial Settlement	A.D. 1756-1824
Mexican National Settlement	A.D. 1824-1836
Anglo/African-American Settlement	A.D. 1823-present

##### 4.6.1 Early French Settlement (A.D. 1685-1820)

Several French occupations have been found within the Texas Gulf Coastal Plain area. The first involves de La Salle's settlement of Fort St. Louis which was established on the shore of Matagorda Bay in 1685. Other alleged French encampments were reported along the Lower Trinity River by Atakapan speakers during the mid 1700s (Bolton 1915; Newcomb 1961; A. Fox et al. 1980). In 1820, Jean La Fitte apparently set up a privateer base on Galveston Island; and two years earlier, a small contingent of Napoleonic exiles established a short-lived town, Champ d' Asile, 20 leagues up the Trinity River (Ratchford 1969; Prewitt et al. 1986).

##### 4.6.2 Spanish Colonial Settlement (A.D. 1756-1824)

Following the French attempts to colonize the Texas Gulf Coastal area, the Spanish successfully established several mission and presidio systems in the area. One of them, San Augustin de Ahumada Nuestra Senora de la Luz, was founded in 1756 along the Trinity River two leagues from the Gulf. The remains of the mission have been located on the present south shore of Lake Miller (Tunnell and Ambler 1967).

The church and sacristy were the focal point of the mission complexes along the Texas Gulf Coastal Plain (A. Fox 1989). Buildings typically associated with the church complex included granaries, shops for carpenters, blacksmiths, weavers, tailors, and spinners, and other dwellings necessary for the general survival of the mission. Living quarters for the Native American mission neophytes were also within the church compound area. Lying outside the mission complex were grist mills, kilns, and irrigated agricultural fields. Large irrigation ditches called acequias were used to transport fresh water from the river sources to the mission compound.

Accompanying the mission/church complexes were the presidios which consisted of a walled military compound with a contingent of soldiers and a commander attached to the missions in areas of extreme hostility. The presidio was composed of a small chapel, guard house, powder magazine, housing for soldiers, and a stable area for the maintenance of horses. The purpose of the presidio was to guard the mission and frontier from attack by hostile Native Americans, and in the case of the Texas coastal missions, attacks from either the French or English (A. Fox 1989). The presidios also supplied troops to the outlying missions for the security of both the missionaries and the Native Americans.

Mission ranches were located in the surrounding countryside. These ranches supplied the livestock needed for the mission population. Due to their possible placement in hostile, or at best, unfriendly territory, the mission ranches were often walled and fortified. In the great majority of the ranches, Native American neophytes tended to the daily running of the livestock operation while the Franciscans visited occasionally (A. Fox 1989).

Overall, the function of the Spanish colonial mission system in the Northern Borderlands was to provide a base for civilian colonists and to convert and assimilate the resident Native American population into the Spanish sociopolitical sphere of influence. However, relative to the San Antonio area further inland, the missions along the Texas Gulf Coastal area were never fully successful in settling colonists or assimilating Native Americans. European diseases and captivity, coupled with the constant predation of hostile Plains Indians such as the Lipan Apache and Comanche, effectively destroyed the native societies of the Karankawa, Akokisa, and Coahuiltecans along the Texas Gulf Coastal Plain by the turn of the nineteenth century.

#### 4.6.3 Mexican National Settlement (A.D. 1824-1836)

By royal decree of the Spanish Crown, the secularization of the northern Mexico and Texas missions began in 1794 but was not completed until 1824 when Mexico achieved its independence from Spain (Weddle 1968; Almaraz 1979). With the onset of secularization, the Spanish support for the missions collapsed after Mexican independence. Gradually, the missions along the Texas Gulf Coastal Plain were abandoned and their usable materials cannibalized and moved to civilian settlements that were appearing near where the missions had once stood (Eaton 1980). As a consequence of secularization and independence, the northern territories of Mexico were in danger of abandonment and depopulation (D. Fox 1983). To fill this void, the Mexican government began a program of colonization whereby land agents or empresarios could be granted a territory in which to settle immigrants who would then become Mexican citizens (A. Fox 1989).

In the Texas Gulf Coastal Plain area, the intention of this colonization was to bring in Anglo-European settlers who practiced small-scale farming and ranching. The majority of these small farmers were of Anglo-Celtic and Mexican descent. There was also the continuation of the large scale Mexican/Spanish ranching interests that emerged during and immediately after the mission period (A. Fox 1989).

#### 4.6.4 Anglo/African-American Settlement (A.D. 1823 - present)

Anglo-Americans and accompanying African-Americans, had begun filtering into the Texas Gulf Coastal Plain area by as early as 1820; however, the first substantial Anglo-American settlement was established between the Lower Colorado and Brazos Rivers by Stephen Austin in 1823 (Freeman 1990). Austin's colony was an empresario grant awarded originally by the Spanish during the last days of their official administration and was subsequently maintained by the Mexican authorities until 1836. The majority of Anglo-American settlers within the colony were from the Lower South who brought with them the institution of slavery and the plantation cotton economy. However, other less economically sophisticated settlers settled the Texas Gulf Coastal Plain area and were primarily engaged in small-scale agriculture and stock raising (Carlson 1983; Mercado-Allinger et al. 1984).

By 1830, the Mexican government had passed a law prohibiting the settling of the Texas Coastal Plain region by Anglo-Americans who were beginning to overwhelm the resident Hispanic population (Freeman 1990). Perhaps more inflammatory to the Anglo-American settlers at the time was the concurrent stipulation of the law which disallowed the importation of slaves into the Texas territory (Freeman 1990). Thus, the right to own and import African slaves along with the right of free Anglo-Americans to settle Texas were the critical factors leading the colonists to secede from Mexico in 1836. Along the Texas Gulf Coastal area, the Texas Revolution was especially disruptive to the local

economy as a result of the destruction of many of the key plantations in the area. After the victory of Sam Houston's forces at San Jacinto and as a consequence of the Mexican-American War of 1846-1848, renewed settlement of the area by Anglo-Americans increased significantly. Large-scale cattle ranching replaced the plantation cotton economy of the Texas Gulf Coastal Plain area by the 1850s (Webb 1952).

With the advent of the railroads after the Civil War, industrialization of the Texas Gulf Coastal Plain area began in earnest. Lumbering became an important industry as early as 1870, remaining so until the resources were effectively depleted in the first decade of the twentieth century (Freeman 1990). Oil production in the 1930s followed. The oil strike at Spindletop catapulted the Houston area into a major urban center prior to World War II. After World War II, the economy of the Texas Gulf Coastal Plain became more focused on agribusiness and the production of petroleum products (Freeman 1990).

#### 4.7 Native American Lands

There are no Native American reservation lands within the counties that comprise the Texas Gulf Coast region.

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Appendix A - Surface Water Basins  
(Texas Gulf Coast)

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Volume 1 - Texas Gulf Coast  
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Appendix A- Surface Water Basins  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants		High Clor.	Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS				Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
SABINE RIVER - Orange Co. Sabine River Tidal Orange (city)	0501 (2412)	29								As, Mn		(6)	(4)		
Adams Bayou Tidal Orange (city)	0508 <sup>1</sup> (2412)	8	X	X			X			met., org.		(4)	(5)	X	X
Cow Bayou Tidal Bridge City	0511 (2412)	20	X				X			met.		(12)	(11)		X
NECHES RIVER - Orange Co. Neches River Tidal Port Arthur	0601	27	X				X			As, Mn		(12)	(36)		X
Pine Island Bayou Hardin Co., Beaumont	0607	81	X	X			X					(11)	X		X
NECHES-TRINITY COASTAL - Jefferson Co.	0701 <sup>1</sup>	33	X	X			X			met.	X	(9)	(6)		X
Taylor Bayou Above Tidal Port Arthur															
Intracoastal Waterway Tidal	0702	63										(3)	(6)		
Sabine-Neches Canal Tidal	0703	22					X			As, Mn		(4)	(13)		
Hillebrandt Bayou Port Arthur, Beaumont	0704 <sup>1</sup>	14	X	X		X	X				X	(3)	(5)		X
TRINITY RIVER - Liberty, Chambers Co.	0801 (2422)	37				X	X				X	(8)	(2)		X
Trinity River Tidal Liberty, Dayton															
Trinity River Below Lake Livingston Liberty (city)	0802 <sup>1</sup>	84		X			X			Cd		(14)	(2)		X

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Appendix A- Surface Water Basins (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants		High Clor.	Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS				Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
TRINITY-SAN JACINTO COASTAL - Harris, Liberty, & Chambers Co. Cedar Bayou Tidal Baytown	0901 <sup>1</sup> (2421, 2426)	19		X		X	X				X	(5)	(11)		X
Cedar Bayou Above Tidal Baytown, Barrett	0902 <sup>1</sup>	25	X	X			X	X				(7)	(8)		X
SAN JACINTO RIVER - Harris Co. San Jacinto River Tidal Bacliff, Seabrook, Deer Park, Friendswood, LaPorte, League City, Baytown, Pasadena, Houston	1001 <sup>1</sup> (2421)	17					X			Hg, As,Mn		(13)	(21)		X
Lake Houston* Houston, Humble, Tomball, Spring, Conroe, Kingwood	1002 <sup>1</sup>	21/ 19.1 sq mi		X		X				Hg	X	(8)	(1)		X
East Fork San Jacinto River Liberty, Montgomery Co.	1003	75										(3)	(2)		
West Fork San Jacinto River Montgomery Co. Conroe, Spring	1004	40				X						(20)	(9)		
Houston Ship Channel/ San Jacinto River Pasadena, Galena Park, Baytown, Houston	1005 <sup>1</sup>	12								Diox. Hg,Ni		(1)	(14)		X

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Appendix A- Surface Water Basins (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants			Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS	High Clor.			Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
SAN JACINTO RIVER (cont.) Houston Ship Channel Pasadena, Deer Park, Galena Park, Baytown, Houston	1006 <sup>1,3</sup>	6				X				Diox. Hg,Ni		(88)	(35)		X
Houston Ship Channel/ Buffalo Bayou Pasadena, Galena Park, Baytown, Houston	1007 <sup>1,3</sup>	14				X				Diox, Hg,Ni Pb,Cd		(47)	(84)		X
Spring Creek Spring, Tomball, Houston	1008 <sup>1</sup>	69	X				X					(43)			X
Cypress Creek Spring, Tomball, Houston	1009 <sup>1</sup>	53	X	X		X	X	X			X	(79)	(7)		X
Caney Creek	1010	57										(12)			
Buffalo Bayou Tidal - Pasadena, Houston, Galena Park	1013 <sup>1</sup>	4		X		X	X			Hg,Cu			(2)		X
Buffalo Bayou Above Tidal - Houston, Bush International Airport	1014 <sup>1</sup>	24		X		X	X				X	(91)	(11)		X
Greens Bayou Above Tidal Humble	1016 <sup>1</sup>	24	X	X		X	X			Pb	X	(94)	(14)		X
White Oak Bayou Above Tidal - Jersey Village, Houston	1017 <sup>1</sup>	23		X		X	X			Pb		(48)	(9)		X
SAN JACINTO-BRAZOS COASTAL Harris, Brazoria, & Ft. Bend Co.	1101 <sup>1</sup>	12		X			X			Org.	X	(6)			X
Clear Creek Tidal Webster, League City															

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Appendix A- Surface Water Basins (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants		High Clor.	Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS				Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
SAN JACINTO-BRAZOS COASTAL (cont.) Clear Creek Above Tidal Pearland, Houston, Friendswood, League City	1102 <sup>1</sup>	30		X		X	X			Org.		(17)	(2)		X
Dickinson Bayou Tidal League City, Dickinson, Texas City	1103 <sup>1</sup> (2439)	15	X				X					(2)	(6)		X
Dickinson Bayou Above Tidal Alvin, Texas City	1104 <sup>1</sup>	7	X				X				X	(2)	(3)		X
Chocolate Bayou Tidal Alvin	1107 (2432)	14									X	(1)	(9)		
Chocolate Bayou Above Tidal Alvin, Manvel, Arcola	1108 <sup>1</sup>	22			X		X	X				(5)	(2)		X
Oyster Creek Tidal Lake Jackson, Clute	1109 <sup>1</sup>	25					X					(1)	(2)		
Oyster Creek Above Tidal Angleton	1110 <sup>1</sup>	77	X				X					(13)	(4)	(3)	X
Armand Bayou Tidal Pasadena, Taylor Lake	1113 <sup>1</sup>	8	X				X				X	(3)	(3)		X
BRAZOS RIVER - Ft. Bend & Brazoria Co.	1201 (2441)	25		X	X	X		X	X	X		(4)	(36)	(1)	X
Brazos River Tidal Upper Oyster Creek Sugarland, Angleton, Lake Jackson	1245 <sup>1</sup>	30	X	X		X	X					(13)	(4)	(1)	X

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Appendix A- Surface Water Basins (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants Coli- forms	High TDS	High Clor.	Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
BRAZOS-COLORADO COASTAL - Brazoria, Fort Bend, Wharton Co.	1301 <sup>1</sup> (2442)	33	X	X		X	X					(5)		X	X
San Bernard River Tidal Freeport, Lake Jackson															
San Bernard River Above Tidal	1302	107		X			X					(9)	(10)	X	X
Brazoria (city)															
Caney Creek Tidal	1304 <sup>1</sup> (2441)	24		X		X	X							X	X
Caney Creek Above Tidal	1305	106		X		X	X					(4)	(1)	(2)	X
COLORADO RIVER BASIN - Matagorda, Wharton Co.	1401 (2451)	27		X		X	X					(2)	(6)		X
Colorado River Tidal Matagorda Co.															
Colorado River Below La Grange	1402	185		X		X	X			X		(9)	(4)	(8)	X
Wharton Co.															
COLORADO-LAVACA COASTAL - Calhoun Co.	1501 (2452)	8	X	X		X	X						(1)		X
Tres Palacios Creek Tidal															
Tres Palacios Creek Above Tidal	1502	34	X	X		X	X					(2)	(2)		X
LAVACA RIVER - Jackson Co.	1602 <sup>1</sup>	94		X		X	X					(4)			X
Lavaca River Above Tidal - Edna															
Navidad River Above Lake Texana - Lavaca Co	1605	62		X		X	X					(2)	(1)	(3)	

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Appendix A- Surface Water Basins (continued)  
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Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants		High Clor.	Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS				Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
GUADALUPE RIVER - Victoria, Calhoun Co.	1801	11													
Guadalupe River Tidal	(2462)														
Guadalupe River Below San Marcos River	1803	169										(10)	(12)	(3)	
SAN ANTONIO RIVER - Victoria, Goliad, Refugio Co.	1901	153		X		X	X					(9)		(1)	X
Lower San Antonio River - Refugio (city)															
SAN ANTONIO-NUECES COASTAL - Refugio, Aransas Co.	2002 <sup>1</sup>	9					X			X		(3)			X
Mission River Above Tidal - Refugio Co.															
Aransas River Above Tidal - Refugio, San Patricio Co.	2004 <sup>1</sup>	58			X		X	X	X			(1)			X
NUECES RIVER - San Patricio, Nueces Co.	2101	12										(3)			
Nueces River Tidal - Corpus Christi	(2482)														
Nueces River Below Lake Corpus Christi - Jim Wells Co., San Patricio Co	2102	35		X		X	X					(2)	(1)	(5)	X

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Appendix A- Surface Water Basins (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No. <sup>1,2</sup>	Segment Length (miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants			Toxic Waste	Chloro- phyll	Sources of Pollution <sup>2</sup>			
							Coli- forms	High TDS	High Clor.			Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non- point
NUECES-RIO GRANDE COASTAL - Nueces, Kleberg, Willacy Co.	2201 <sup>1</sup> (2491)	26	X	X		X					X	(1)	(4)	(2)	X
Arroyo Colorado Tidal Willacy Co.															
Arroyo Colorado Above Tidal	2202 <sup>1</sup>	63	X	X		X	X			Met, Org.	X	(26)	(6)	(1)	X
Harlingen, Cameron Co.															
Petronila Creek Tidal	2203	14													
Padre Island	(2492)														
Petronila Creek Above Tidal - Robstown, Driscoll	2204	44		X	X			X	X	Ba		(6)			X
RIO GRANDE - Cameron, Hidalgo, Starr Co.	2301	49		X		X					X	(1)		(1)	
Rio Grande Tidal															
Brownsville, Port Isabel															
Rio Grande Below Falcon Reservoir -	2302 <sup>1</sup>	231		X		X	X	X		X		(9)	(2)	(3)	X
McAllen, Mission, Rio Grande City, Harlingen															

The symbol X indicates that this segment or a portion of this segment has been found to contain elevated levels of the indicated pollutant or accommodates the indicated pollutant sources.

1 This segment is listed in the State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for the Development of TMDL

2 Numbers in parenthesis (n) indicate number of permitted outfalls for this segment

3 This segment is also addressed in the Galveston Bay National Estuary Program, 1992

Note: Portions of these segments coincide with Coastal Basins listed in Table 17. Segment numbers corresponding with Coastal Basin segments are in parentheses (nnnn).

Key to abbreviations: O<sub>2</sub> - dissolved oxygen, P - phosphorous compounds, S - sulfur compounds, N - nitrogen compounds, Coliforms - fecal coliform bacteria, TDS - total dissolved solids, Clor. - chlorinated compounds,  
Toxic Waste - heavy metals or toxic organic compounds, Chlorophyll - chlorophyll α, Dom WW - domestic wastewater outfalls, Indus WW - industrial wastewater outfalls, Agri. - agricultural waste discharge,  
Non-point - non-point sources of wastewater,

Key to Toxic Wastes: Hg - mercury, As - arsenic, Cd - cadmium, Cu - copper, Ni - nickel, Diox. - dioxin, Pb - lead, Mn - manganese, org. - organic compounds

Source: TNRCC, 1996, 1998 (From State of Texas Water Quality Inventory, 1996)

Appendix B - Coastal Bays and Estuaries  
(Texas Gulf Coast)

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Appendix B - Coastal Bays and Estuaries  
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Basin/Drainage Name	Segment No.	Segment Area (sq. miles)						Pollutants				Sources of Pollution				
Associated County/City			Low O <sub>2</sub>	High P	High S	High N		Coli-forms	High TDS	High Chlor.	Toxic Waste	Chlorophyll	Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non-point
<b>SABINE PASS</b> - Jefferson Co. Port Arthur	<b>2411</b>	2.1						X			met.					
<b>SABINE LAKE</b> - Orange & Jefferson Co. Port Arthur, Bridge City	<b>2412</b>	68.7						X			met.					X
NECHES-TRINITY COASTAL - Jefferson, Chambers Co.																
<b>Trinity Bay</b> - Baytown	<b>2422<sup>1</sup></b>	130.1				X					met.		(4)	(4)		X
<b>East Bay</b> - Anahuac N.W.R.	<b>2423<sup>1</sup></b>	52.1									Hg					X
<b>Lower Galveston Bay</b>	<b>2439<sup>1</sup></b>	139.6														
TRINITY-SAN JACINTO COASTAL - Harris & Chambers Co.																
<b>Upper Galveston Bay</b> - Galveston, Houston, Pasadena, Baytown	<b>2421<sup>1</sup></b>	108.2				X				X	Diox		(6)	(3)		X
<b>Tabbs Bay</b> - Baytown	<b>2426<sup>1</sup></b>	3.6		X		X	X				Diox		(3)	(2)		X
<b>Black Duck Bay</b> - Baytown	<b>2428<sup>1</sup></b>	0.6	X	X		X	X			X	Diox					
<b>Scott Bay</b> - Baytown	<b>2429<sup>1</sup></b>	1.7		X		X	X				Diox			(1)		
<b>Burnett Bay</b> - Baytown	<b>2430<sup>1</sup></b>	2.7		X		X				X	Diox, met.			(2)		

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Appendix B - Coastal Bays and Estuaries  
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Basin/Drainage Name	Segment No.	Segment Area (sq. miles)					Pollutants				Sources of Pollution				
Associated County/City			Low O <sub>2</sub>	High P	High S	High N	Coli-forms	High TDS	High Chlor.	Toxic Waste	Chlorophyll	Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non-point
SAN JACINTO-BRAZOS COASTAL - Galveston, Harris Co.															
<b>West Bay</b> - Galveston, Texas City, Houston	<b>2424<sup>1</sup></b>	69.3								Hg, Cu, org. org.		(13)	(1)		X
<b>Clear Lake</b> - La Porte, Seabrook, Pasadena, Bacliff	<b>2425<sup>1</sup></b>	2.0	X	X		X		X	X			(3)	(10)		X
<b>San Jacinto Bay</b> - La Porte	<b>2427<sup>1</sup></b>	2.1		X		X				Diox			(22)		
<b>Moses Lake</b> - La Marque, Texas City	<b>2431</b>	3.3										(1)	(2)		
<b>Chocolate Bay</b> - Alvin	<b>2432<sup>1</sup></b>	7.6					X			As		(4)			X
<b>Bastrop Bay/Oyster Lake</b>	<b>2433</b>	3.9					X								
<b>Christmas Bay</b>	<b>2434</b>	8.9						X							X
<b>Drum Bay</b>	<b>2435</b>	1.7					X								X
<b>Barbours Cut</b> - La Porte	<b>2436<sup>1</sup></b>	0.2	X	X		X	X			Diox		(1)	(1)		
<b>Texas City Ship Channel</b> - La Marque, Texas City	<b>2437<sup>1</sup></b>	0.6	X	X		X			X	Cr			(15)		
<b>Bayport Channel</b> - Pasadena	<b>2438</b>	0.9	X	X									(4)		
<b>Lower Galveston Bay<sup>3</sup></b> - Galveston, Texas City	<b>2439<sup>1</sup></b>	139.6				X	X			Hg, Cu		(6)	(5)		X

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Appendix B - Coastal Bays and Estuaries  
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Basin/Drainage Name	Segment No.	Segment Area (sq. miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants				Sources of Pollution				
Associated County/City							Coli-forms	High TDS	High Chlor.	Toxic Waste	Chloro phyll	Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non-point
BRAZOS-COLORADO COASTAL - Matagorda Co.															
East Matagorda Bay	2441 <sup>1</sup>	59.1					X					(3)			X
Cedar Lakes	2442 <sup>1</sup>	6.9					X								X
COLORADO-LAVACA COASTAL - Jackson, Matagorda Co.															
Matagorda Bay/Powderhorn Lake	2451 <sup>1</sup>	261.7					X					(1)	(2)		X
Tres Palacios Bay/Turtle Bay	2452 <sup>1</sup>	14.7					X			Cu		(2)	(1)		X
Cox Bay	2454 <sup>1</sup>	2.9					X			Ba,Hg		(1)	(3)		X
Keller Bay	2455	7.5					X								
Carancahua Bay	2456 <sup>1</sup>	19.0					X					(2)			X
LAVACA-GUADALUPE COASTAL - Calhoun, Victoria Co.															
Lavaca Bay/Chocolate Bay	2453 <sup>1</sup>	54.8					X			met.		(8)	(8)		X
San Antonio Bay/Hynes Bay/Guadalupe Bay	2462 <sup>1</sup>	119.5					X					(3)			X
SAN ANTONIO-NUECES COASTAL - Refugio, Aransas, San Patricio Co.															
Aransas Bay	2471 <sup>1</sup>	87.8					X					(2)			X
Copano Bay/Port Bay/Mission Bay	2472 <sup>1</sup>	65.2					X			Ba	X	(3)			X

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Appendix B - Coastal Bays and Estuaries  
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Basin/Drainage Name	Segment No.	Segment Area (sq. miles)	Low O <sub>2</sub>	High P	High S	High N	Pollutants	Coli-forms	High TDS	High Chlor.	Toxic Waste	Chlorophyll	Dom WW <sup>2</sup>	Indus WW <sup>2</sup>	Agri.	Non-point
Associated County/City																
SAN ANTONIO-NUECES COASTAL - Refugio, Aransas, San Patricio Co. (continued)																
St. Charles Bay	2473 <sup>1</sup>	13.1						X					(1)	(1)		X
Nueces Bay - Corpus Christi	2482 <sup>1</sup>	28.9						X			Cd,Zn		(2)	(3)		X
Redfish Bay- Corpus Christi	2483	28.8											(2)	(5)		
NUECES-RIO GRANDE COASTAL - San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron Co.																
Corpus Christi Bay - Corpus Christi, Portland	2481 <sup>1</sup>	123.1	X					X			met.		(7)	(7)		X
Corpus Christi Inner Harbor - Corpus Christi	2484	0.7	X	X		X					met., Org.		(1)	(29)		X
Oso Bay - Corpus Christi	2485 <sup>1</sup>	7.2	X	X		X		X					(6)	(3)		X
Laguna Madre- Kleberg, Kenedy, Willacy Co.	2491 <sup>1</sup>	347.4	X			X		X			met.		(20)	(4)	(2)	X
Baffin Bay - Kleberg, Kenedy Co.	2492	49.8									Ba,As	X	(14)	(4)	(3)	X
South Bay - Brownsville, Port Isabel	2493	7.8														X

The symbol **X** indicates that this segment or a portion of this segment has been found to contain elevated levels of the indicated pollutant or accommodates the indicated pollutant sources.

<sup>1</sup>This segment is listed in the State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for the Development of TMDL

<sup>2</sup>Numbers in parenthesis (**n**) indicate number of permitted outfalls for this segment

<sup>3</sup>This segment is also addressed in the Galveston Bay National Estuary Program, 1992

Note: Portions of these segments coincide with Coastal Basins listed in Table 17. Segment numbers corresponding with Coastal Basin segments are in parentheses (**nnnn**).

Key to abbreviations: **O<sub>2</sub>** - dissolved oxygen, **P** - phosphorous compounds, **S** - sulfur compounds, **N** - nitrogen compounds, **Coliforms** - fecal coliform bacteria, **TDS** - total dissolved solids, **Chlor.** - chlorinated compounds, **Toxic Waste** - heavy metals or toxic organic compounds, **Chlorophyll** - chlorophyll  $\alpha$ , **Dom WW** - domestic wastewater outfalls, **Indus WW** - industrial wastewater outfalls, **Agri.** - agricultural waste discharge, **Non-point** - non-point sources of wastewater,

Key to Toxic Wastes: **Hg** - mercury, **As** - arsenic, **Cd** - cadmium, **Cu** - copper, **Ni** - nickel, **Diox.** - dioxin, **Pb** - lead, **Mn** - manganese, **Zn** - zinc, **met.** - various heavy metals, **org.** - organic compounds

Source: TNRCC, 1996, 1998 (From State of Texas Water Quality Inventory, 1996)

Appendix C - Texas Surface Water Quality Standards General Criteria  
(Texas Gulf Coast)

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Appendix C - Texas Surface Water Quality Standards General Criteria  
(Texas Gulf Coast)

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(a) Application. The general criteria set forth in this section apply to surface water in Texas and specifically apply to substances attributed to waste discharges or the activities of man. General criteria do not apply to those instances in which surface water, as a result of natural phenomena, exhibit characteristics beyond the limits established by this section. General criteria are superseded by specific exemptions stated in this section or in § 307.8 of this title (relating to the Application of Standards), or by site-specific water quality standards for classified segments. Provisions of the general criteria remain in effect in mixing zones or below critical low-flow conditions unless specifically exempted in § 307.8 of this title (relating to the Application of Standards).

(b) Aesthetic parameters.

(1) Concentrations of taste and odor producing substances shall not interfere with the production of potable water by reasonable water treatment methods, impart unpalatable flavor to food fish including shellfish, result in offensive odors arising from the waters, or otherwise interfere with the reasonable use of the water in the state.

(2) Surface water shall be essentially free of floating debris and suspended solids that are conducive to producing adverse responses in aquatic organisms or putrescible sludge deposits or sediment layers which adversely affect benthic biota or any lawful uses.

(3) Surface waters shall be essentially free of settleable solids conducive to changes in flow characteristics of stream channels or the untimely filling of reservoirs, lakes, and bays.

(4) Surface waters shall be maintained in an aesthetically attractive condition.

(5) Waste discharges shall not cause substantial and persistent changes from ambient conditions of turbidity or color.

(6) There shall be no foaming or frothing of a persistent nature.

(7) Surface waters shall be maintained so that oil, grease, or related residue will not produce a visible film of oil or globules of grease on the surface or coat the banks or bottoms of the watercourse; or cause toxicity to man, aquatic life, or terrestrial life in accordance with § 307.4(d) of this title (relating to General Criteria).

(c) Radiological parameters. Radioactive materials shall not be discharged in excess of the amount regulated by Chapter 336 of this title (relating to Radiation Rules).

(d) Toxic parameters. Surface waters will not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with the skin, or to terrestrial or aquatic life. Additional standards requirements for toxic materials are specified in § 307.6 of this title (relating to Toxic Materials).

(e) Nutrient parameters. Nutrients from permitted discharges or other controllable sources shall not cause excessive growth of aquatic vegetation which impairs an existing, attainable, or designated use. Site-specific nutrient criteria, nutrient permit limitations, and/or separate rules to control nutrients in individual watersheds will be established where appropriate after notice and opportunity for public participation and proper hearing.

(f) Temperature. Consistent with § 307.1 of this title (relating to General Policy Statement) and in accordance with state water rights permits, temperature in industrial cooling lake impoundments and all other surface water in the state shall be maintained so as to not interfere with the reasonable use of such waters. Numerical temperature criteria have not been specifically established for industrial cooling lake impoundments, which in most areas of the state contribute to water conservation and water quality objectives. With the exception of industrial cooling impoundments, temperature elevations due to discharges of treated domestic (sanitary) effluent, and designated mixing zones, the following temperature criteria, expressed as a maximum temperature differential (rise over ambient) are established: freshwater streams -5 degrees Fahrenheit; freshwater lakes and impoundments--3 degrees Fahrenheit; tidal river reaches, bay and gulf waters--4 degrees Fahrenheit in fall, winter, and spring, and 1.5 degrees Fahrenheit in summer (June, July, and August). Additional temperature criteria (expressed as maximum temperatures) for classified segments are specified in Appendix A of § 307.10 of this title (relating to Appendices A-E).

(g) Salinity.

(1) Estuarine salinity criteria have not been established, despite the recognition that proper salinity gradient maintenance is important for the continuation of balanced and desirable populations of estuarine dependent marine life, because weather is the dominant factor influencing salinity gradients.

(2) Absence of numerical salinity criteria shall not preclude evaluations and regulatory actions based on estuarine salinity, and careful consideration will be given to all activities which may detrimentally affect salinity gradients

in estuarine waters.

(3) Concentrations and the relative ratios of dissolved minerals such as chlorides, sulfates, and total dissolved solids will be maintained such that attainable uses will not be impaired.

(h) Dissolved oxygen and aquatic life uses.

(1) Dissolved oxygen criteria for unclassified waters with aquatic life uses will be sufficient to support appropriate aquatic life use categories, in accordance with § 307.7 of this title (relating to Site-specific Uses and Criteria). Perennial streams, rivers, lakes, bays, estuaries, and other appropriate perennial waters which are not specifically listed in Appendix A or D of § 307.10 of this title are presumed to have a high aquatic life use and corresponding dissolved oxygen criteria. In accordance with results from statewide ecoregion studies, unclassified perennial streams in southeast and northeast Texas are assigned dissolved oxygen criteria as indicated in § 307.7(b)(3)(A)(ii) of this title. Higher uses will be maintained where they are attainable.

(2) Intermittent streams which are not specifically listed in Appendix A or D of § 307.10 of this title will maintain a 24-hour dissolved oxygen mean of 2.0 mg/L and an absolute minimum dissolved oxygen concentration of 1.5 mg/L. For intermittent streams with seasonal aquatic life uses, dissolved oxygen concentrations commensurate with the aquatic life uses will be maintained during the seasons in which the aquatic life uses occur. Unclassified intermittent streams with significant aquatic life uses created by perennial pools are presumed to have a limited aquatic life use and corresponding dissolved oxygen criteria. Additional definitions of significant aquatic life, perennial pools, and seasonal uses will be developed in the standards implementation procedures. Higher uses will be maintained where they are attainable.

(i) Bacteria. A fecal coliform criterion of not more than 200 bacteria per 100 ml shall apply to all water bodies not specifically listed in Appendix A of § 307.10 of this title (relating to Appendices A-E). Application of this criterion shall be in accordance with § 307.7(b)(1) of this title.

(j) Antidegradation. Nothing in this section shall be construed or otherwise utilized to supersede the requirements of § 307.5 of this title (relating to Antidegradation).

(k) Assessment of unclassified waters. Waters which are not specifically listed in Appendices A or D of § 307.10 of this title are designated for the specific uses that are attainable or characteristic of those waters. Upon administrative or regulatory action by the commission which affects a particular unclassified waterbody, the characteristics of the affected waterbody will be reviewed to determine which aquatic life uses are appropriate. Additional uses so determined shall be indicated in public notices for discharge applications. Uses which are not applicable throughout the year in a particular unclassified waterbody will be assigned and protected for the seasons in which such uses are attainable. Initial determinations of use shall be considered preliminary, and in no way preclude redeterminations of use in public hearings conducted by the commission under the provisions of the Texas Water Code. For unclassified waters where the presumed minimum uses or criteria specified in this section are inappropriate, site-specific standards may be developed in accordance with § 307.2(d) of this title (relating to Modification of Standards). Uses and criteria will be assigned in accordance with this section and with § 307.7(3) of this title. Procedures for assigning uses and criteria are described in the standards implementation procedures.

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Source: The provisions of this § 307.4 adopted to be effective July 10, 1991, 16 TexReg 3400; amended to be effective July 13, 1995, 20 TexReg 4701; amended to be effective April 30, 1997, 22 TexReg 3712.

Appendix D - Surface Water Basins, Designated Water Uses and Quality Criteria, 1996  
(Texas Gulf Coast)

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Appendix D - Surface Water Basins, Designated Water Uses and Quality Criteria, 1996  
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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
SABINE RIVER - Orange Co. Sabine River Tidal Orange (city)	501	S	NA	NA	S				4.0	6.0- 8.5	200	95
Adams Bayou Tidal Orange (city)	0508 <sup>1</sup> (2412) <sup>2</sup>	NS	NA	NA	S				4.0	6.0- 8.5	200	95
Cow Bayou Tidal Bridge City	0511 (2412)	S	NA	NA	S				4.0	6.0- 8.5	200	95
NECHES RIVER - Orange Co. Neches River Tidal Port Arthur	0601	S	NA	NA	S				3.0	6.0- 8.5	200	95
Pine Island Bayou Hardin Co., Beaumont	0607	NS	S	NS	S	150	50	300	5.0	6.0- 8.5	200	95
NECHES-TRINITY COASTAL - Jefferson Co. Taylor Bayou Above Tidal Port Arthur	0701 <sup>1</sup>	NS	NA	NA	S	400	100	1,100	730	6.5- 9.0	200	95
Intracoastal Waterway Tidal	0702	S	NA	NA	S				4.0	6.5- 9.0	200	95
Sabine-Neches Canal Tidal	0703	S	NA	NA	S				4.0	6.5- 9.0	200	95
Hillebrandt Bayou Port Arthur, Beaumont	0704 <sup>1</sup>	NS	NA	NA	S	250	100	600	4.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
TRINITY RIVER - Liberty, Chambers Co.	0801	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Trinity River Tidal Liberty, Dayton	(2422)											
Trinity River Below Lake Livingston Liberty (city)	0802 <sup>1</sup>	NS	S	NA	S	125	100	600	5.0	6.5- 9.0	200	93
TRINITY-SAN JACINTO COASTAL - Harris, Liberty, & Chambers Co.	0901 <sup>1</sup> (2421, 2426)	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Cedar Bayou Tidal Baytown												
Cedar Bayou Above Tidal	0902 <sup>1</sup>	NS	S	NA	S	200	100	400	5.0	6.5- 9.0	200	90
Baytown, Barrett												
SAN JACINTO RIVER - Harris Co. San Jacinto River Tidal	1001 <sup>1</sup> (2421)	S							4.0	6.5- 9.0	200	95
Bacliff, Seabrook, Deer Park, Friendswood, LaPorte, League City, Baytown, Pasadena, Houston												
Lake Houston* Houston, Humble, Tomball, Spring, Conroe, Kingwood	1002 <sup>1</sup>	S				100	50	200	5.0	6.5- 9.0	200	90

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
SAN JACINTO RIVER - Harris Co. San Jacinto River Tidal (cont.)	1003	S				80	40	400	5.0	6.0- 8.5	200	91
East Fork San Jacinto River Liberty, Montgomery Co.												
West Fork San Jacinto River Montgomery Co. Conroe, Spring	1004	S				80	40	300	5.0	6.5- 9.0	200	95
Houston Ship Channel/ San Jacinto River Pasadena, Galena Park, Baytown, Houston	1005 <sup>1</sup>	NA							4.0	6.5- 9.0	200	95
Houston Ship Channel Pasadena, Deer Park, Galena Park, Baytown, Houston	1006 <sup>1,3</sup>	NA							2.0	6.5- 9.0	168**	95
Houston Ship Channel/Buffalo Bayou Pasadena, Galena Park, Baytown, Houston	1007 <sup>1,3</sup>	NA							1.0	6.5- 9.0	168**	95
Spring Creek Spring, Tomball, Houston	1008 <sup>1</sup>	NS				80	40	300	5.0	6.5- 9.0	200	90

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
SAN JACINTO RIVER - Harris Co. San Jacinto River Tidal (cont.)	1009 <sup>1</sup>	NS				80	40	300	5.0	6.5- 9.0	200	90
Cypress Creek Spring, Tomball, Houston Caney Creek	1010	S				50	40	300	5.0	6.0- 8.5	200	90
Buffalo Bayou Tidal - Pasadena, Houston, Galena Park	1013 <sup>1</sup>	NS							3.0	6.5- 9.0	200	92
Buffalo Bayou Above Tidal - Houston, Bush International Airport	1014 <sup>1</sup>	NS				110	65	600	3.0	6.5- 9.0	200	92
Greens Bayou Above Tidal Humble	1016 <sup>1</sup>	NS				110	65	600	3.0	6.5- 9.0	200	92
White Oak Bayou Above Tidal - Jersey Village, Houston	1017 <sup>1</sup>	NS				110	65	600	3.0	6.5- 9.0	200	92
SAN JACINTO-BRAZOS COASTAL Harris, Brazoria, & Ft. Bend Co. Clear Creek Tidal Webster, League City	1101 <sup>1</sup>	NS	NA	NA	NS				4.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
SAN JACINTO-BRAZOS COASTAL Harris, Brazoria, & Ft. Bend Co. (cont.)	1102 <sup>1</sup>	NS	NA	NA	NS	200	400	600	5.0	6.5- 9.0	200	95
Clear Creek Above Tidal Pearland, Houston, Friendswood, League City	1103 <sup>1</sup> (2439)	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Dickinson Bayou Tidal League City, Dickinson, Texas City	1104 <sup>1</sup>	NS	NA	NA	S	200	100	600	4.0	6.5- 9.0	200	90
Dickinson Bayou Above Tidal Alvin, Texas City	1107 (2432)	S	NA	NA	S				4.0	6.5- 9.0	200	95
Chocolate Bayou Tidal Alvin	1108 <sup>1</sup>	NS	NA	NA	S	150	50	600	5.0	6.5- 9.0	200	90
Chocolate Bayou Above Tidal Alvin, Manvel, Arcola	1109 <sup>1</sup>	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Oyster Creek Tidal Lake Jackson, Clute	1110 <sup>1</sup>	NS	S	NA	S	300	150	750	5.0	6.5- 9.0	200	90
Oyster Creek Above Tidal Angleton	1113 <sup>1</sup>	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Armand Bayou Tidal Pasadena, Taylor Lake												

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
BRAZOS RIVER - Ft. Bend & Brazoria Co. Brazos River Tidal	1201 (2441)	S	S	NA	NS				4.0	6.5-9.0	200	95
Upper Oyster Creek Sugarland, Angleton, Lake Jackson	1245 <sup>1</sup>	S	S	NA	S	140	75	1,070	4.0	6.5-9.0	200	95
BRAZOS-COLORADO COASTAL - Brazoria, Fort Bend, Wharton Co. San Bernard River Tidal Freeport, Lake Jackson San Bernard River Above Tidal Brazoria (city) Caney Creek Tidal	1301 <sup>1</sup> (2442)	NS	NA	NA	S				4.0	6.5-9.0	200	95
	1302	S	S	NA	S	100	50	500	5.0	6.5-9.0	200	90
	1304 <sup>1</sup> (2441)	NS	NA	NA	S				4.0	6.5-9.0	200	95
Caney Creek Above Tidal	1305	S	NA	NA	S	200	75	1,000	5.0	6.5-9.0	200	90
									4.0	6.5-9.0	200	95
COLORADO RIVER BASIN - Matagorda, Wharton Co. Colorado River Tidal Matagorda Co. Colorado River Below Smithville Wharton Co.	1401 (2451)	S	NA	NA	S							
	1402	S	S	NA	S	90	60	450	5.0	6.5-9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- orm #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
COLORADO-LAVACA COASTAL - Calhoun Co. Tres Palacios Creek Tidal	1501 (2452)	NS	NA	NA	S				5.0	6.5- 9.0	200	95
Tres Palacios Creek Above Tidal	1502	NS	NA	NA	S	250	100	600	5.0	6.5- 9.0	200	90
LAVACA RIVER - Jackson Co. Lavaca River Tidal -	1601	S	NA	NA	S				4.0	6.5- 9.0	200	95
Lavaca River Above Tidal - Edna	1602 <sup>1</sup>	NS	S	NA	S	150	75	500	5.0	6.5- 9.0	200	91
Navidad River Tidal	1603	S	S	NA	S				4.0	6.5- 9.0	200	91
Lake Texana	1604	S	S	NA	S	80	25	450	5.0	6.5- 9.0	200	93
Navidad River Above Lake Texana - Lavaca Co	1605	S	S	NA	S	100	30	550	5.0	6.5- 9.0	200	91
LAVACA-GUADALUPE COASTAL Victoria Barge Canal Tidal	1701	NA	NA	NA	S				4.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
GUADALUPE RIVER - Victoria, Calhoun Co. Guadalupe River Tidal	1801 (2462)	S	NA	NA	S				5.0	6.5- 9.0	200	95
Guadalupe River Below San Marcos River	1803	S	S	NA	S	100	50	400	5.0	6.5- 9.0	200	93
SAN ANTONIO RIVER - Victoria, Goliad, Refugio Co. Lower San Antonio River - Refugio (city)	1901	NS	NA	NA	S	180	140	750	5.0	6.5- 9.0	200	90
SAN ANTONIO-NUECES COASTAL - Refugio, Aransas Co. Mission River Tidal - Refugio Co.	2001	NS	NA	NA	S				4.0	6.5- 9.0	200	95
Mission River Above Tidal - Refugio Co.	2002 <sup>1</sup>	NS	NA	NA	S	850	100	2,000	5.0	6.5- 9.0	200	95
Aransas River Tidal	2003	S	NA	NA	S				4.0	6.5- 9.0	200	95
Aransas River Above Tidal - Refugio, San Patricio Co.	2004 <sup>1</sup>	NS	NA	NA	S	300	50	600	5.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
NUECES RIVER - San Patricio, Nueces Co.	2101 (2482)	S	NA	NA	S				5.0	6.5- 9.0	200	95
Nueces River Tidal - Corpus Christi												
Nueces River Below Lake Corpus Christi - Jim Wells Co., San Patricio Co	2102	S	S	NA	S	250	250	500	5.0	6.5- 9.0	200	91
Lake Corpus Christi	2103	S	S	NA	S	250	250	500	5.0	6.5- 9.0	200	93
NUECES-RIO GRANDE COASTAL - Nueces, Kleberg, Willacy Co.	2201 <sup>1</sup> (2491)	S	NA	NA	S				4.0	6.5- 9.0	200	95
Arroyo Colorado Tidal Willacy Co.												
Arroyo Colorado Above Tidal	2202 <sup>1</sup>	NS	NA	NA	NS	1,200	1,000	4,000	4.0	6.5- 9.0	200	95
Harlingen, Cameron Co.												
Petronila Creek Tidal Padre Island	2203 (2492)	S	NA	NA	S				4.0	6.5- 9.0	200	95
Petronila Creek Above Tidal - Robstown, Driscoll	2204	S	NA	NA	S	1,500	500	4,000	4.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				Cl-1 (mg/L)	SO4-2 (mg/L)	TDS (mg/L)	Criteria Dissol- ved Oxygen (mg/L)	pH Range	Fecal Colif- orm #/100 ml	Temp- erature (°F)
		Contact Recrea- tion	Public Water Supply	Oyster Waters	Fish Cons- ump- tion							
RIO GRANDE - Cameron, Hidalgo, Starr Co. Rio Grande Tidal Brownsville, Port Isabel	2301	S	NA	NA	S				5.0	6.5- 9.0	200	95
Rio Grande Below Falcon Reservoir - McAllen, Mission, Rio Grande City, Harlingen	2302 <sup>1</sup>	NS	S	NA	S	270	350	880	5.0	6.5- 9.0	200	90

Key: S - segment water quality supports this designated use; NS - segment water quality does not support this use; NA - this use is not naturally supported by this segment

<sup>1</sup> This segment is listed in the State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for the Development of TMDL

<sup>2</sup> Portions of these segments coincide with Coastal Basins listed in Table 19. Segment numbers corresponding with Coastal Basin segments are in parentheses (nnnn).

<sup>3</sup> This segment is also addressed in the Galveston Bay National Estuary Program, 1992

Source: TNRCC, 1996, 1998

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Appendix E - Coastal Bays and Estuaries Designated Use Support Inventory  
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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support				DO (mg/L)	Criteria		
		Contact Recreation	Public Water Supply	Oyster Waters	Fish Consumption		pH Range	Fecal Coli- form #/100 ml	Temperature (°F)
SABINE PASS – Jefferson Co. Port Arthur	2411	S	NA	NS	S	5.0	6.5- 9.0	14	95
SABINE LAKE – Orange & Jefferson Co. Port Arthur, Bridge City	2412	S	NA	NS	S	4.0	6.5- 9.0	14	95
NECHES-TRINITY COASTAL – Jefferson, Chambers Co.									
Trinity Bay – Baytown	2422 <sup>1</sup>	S	NA	S	S	4.0	6.5- 9.0	14	95
East Bay – Anahuac N.W.R.	2423 <sup>1</sup>	S	NA	S	S	4.0	6.5- 9.0	14	95
Lower Galveston Bay	2439 <sup>1</sup>	S	NA	S	S	4.0	6.5- 9.0	14	95
TRINITY-SAN JACINTO COASTAL – Harris & Chambers Co.							6.5- 9.0		
Upper Galveston Bay – Galveston, Houston, Pasadena, Baytown	2421 <sup>1</sup>	S	NA	S	NS	4.0	6.5- 9.0	14	95
Tabbs Bay – Baytown	2426 <sup>1</sup>	NS	NA	NA	NS	4.0	6.5- 9.0	200	95
Black Duck Bay – Baytown	2428 <sup>1</sup>	S	NA	NA	NS	4.0	6.5- 9.0	200	95
Scott Bay - Baytown	2429 <sup>1</sup>	NS	NA	NA	NS	4.0	6.5- 9.0	200	95
Burnett Bay - Baytown	2430 <sup>1</sup>	S	NA	NA	NS		6.5- 9.0	200	95
SAN JACINTO-BRAZOS COASTAL - Galveston, Harris Co.									
West Bay - Galveston, Texas City, Houston	2424 <sup>1</sup>	S	NA	S	S	4.0	6.5- 9.0	14	95
Clear Lake - La Porte, Seabrook, Pasadena, Bacliff	2425 <sup>1</sup>	NS	NA	NA	S	4.0	6.5- 9.0	200	95
San Jacinto Bay - La Porte	2427 <sup>1</sup>	S	NA	NA	NS	4.0	6.5- 9.0	200	95

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support					Criteria				
		Contact Recreation	Public Water Supply	Oyster Waters	Fish Consumption	DO (mg/L)	pH Range	Fecal Coli- form #/100 ml	Temp- erature (°F)		
SAN JACINTO-BRAZOS											
COASTAL - Galveston, Harris											
Co. (continued)											
Moses Lake - La Marque, Texas City	2431	S	NA	NA	S	4.0	6.5-9.0	200	95		
Chocolate Bay - Alvin	2432 <sup>1</sup>	S	NA	S	S	4.0	6.5-9.0	14	95		
Bastrop Bay/Oyster Lake	2433	S	NA	S	S	4.0	6.5-9.0	14	95		
Christmas Bay	2434	S	NA	S	S	4.0	6.5-9.0	14	95		
Drum Bay	2435	S	NA	S	S	4.0	6.5-9.0	14	95		
Barbours Cut - La Porte	2436 <sup>1</sup>	S	NA	NA	NS	4.0	6.5-9.0	200	95		
Texas City Ship Channel - La Marque, Texas City	2437 <sup>1</sup>	NA	NA	NA	S	4.0	6.5-9.0	200	95		
Bayport Channel - Pasadena	2438	NA	NA	NA	S	4.0	6.5-9.0	200	95		
Lower Galveston Bay3 - Galveston, Texas City	2439 <sup>1</sup>	S	NA	S	S	4.0	6.5-9.0	14	95		
BRAZOS-COLORADO											
COASTAL - Matagorda Co.											
East Matagorda Bay	2441 <sup>1</sup>	S	NA	S	S	5.0	6.5-9.0	14	95		
Cedar Lakes	2442 <sup>1</sup>	S	NA	NS	S	4.0	6.5-9.0	14	95		
COLORADO-LAVACA											
COASTAL - Jackson, Matagorda Co.											
Matagorda Bay/Powderhorn Lake	2451 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95		
Tres Palacios Bay/Turtle Bay	2452 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95		
Cox Bay	2454 <sup>1</sup>	S	NA	S	NS	5.0	6.5-9.0	14	95		

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Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support					Criteria		
		Contact Recreation	Public Water Supply	Oyster Waters	Fish Consumption	DO (mg/L)	pH Range	Fecal Coli-form #/100 ml	Temperature (°F)
COLORADO-LAVACA COASTAL - Jackson, Matagorda Co. (continued)									
Keller Bay	2455	S	NA	S	S	5.0	6.5-9.0	14	95
Carancahua Bay	2456 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95
LAVACA-GUADALUPE COASTAL - Calhoun, Victoria Co.									
Lavaca Bay/Chocolate Bay	2453 <sup>1</sup>	S	NA	NS	NS	5.0	6.5-9.0	14	95
San Antonio Bay/Hynes Bay/Guadalupe Bay	2462 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95
SAN ANTONIO-NUECES COASTAL - Refugio, Aransas, San Patricio Co.									
Aransas Bay	2471 <sup>1</sup>	S	NA	S	S	5.0	6.5-9.0	14	95
Copano Bay/Port Bay/Mission Bay	2472 <sup>1</sup>	S	NA	S	S	5.0	6.5-9.0	14	95
St. Charles Bay	2473 <sup>1</sup>	S	NA	S	S	5.0	6.5-9.0	14	95
Nueces Bay - Corpus Christi	2482 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95
Redfish Bay- Corpus Christi	2483	S	NA	S	S	5.0	6.5-9.0	14	95
NUECES-RIO GRANDE COASTAL - San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron Co.									
Corpus Christi Bay - Corpus Christi, Portland	2481 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95
Corpus Christi Inner Harbor - Corpus Christi	2484	NA	NA	S	S	3.0	6.5-9.0	200	95
Oso Bay - Corpus Christi	2485 <sup>1</sup>	S	NA	NS	S	5.0	6.5-9.0	14	95

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Appendix E - Coastal Bays and Estuaries Designated Use Support Inventory (continued)  
(Texas Gulf Coast)

Basin/Drainage Name Associated County/City	Segment No.	Designated Use Support					Criteria		
		Contact Recreation	Public Water Supply	Oyster Waters	Fish Consumption	DO (mg/L)	pH Range	Fecal Coli-form #/100 ml	Temperature (°F)
NUECES-RIO GRANDE COASTAL - San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron Co. (cont.)									
Laguna Madre- Kleberg, Kenedy, Willacy Co.	2491 <sup>1</sup>	S	NA	S	S	5.0	6.5- 9.0	14	95
Baffin Bay - Kleberg, Kenedy Co.	2492	S	NA	S	S	4.0	6.5- 9.0	14	95
South Bay - Brownsville, Port Isabel	2493	S	NA	S	S	5.0	6.5- 9.0	14	95
SOUTHERN GULF COAST									
Espiritu Santo Bay	2461	S	NA	S	S	5.0	6.5- 9.0	14	95
Brownsville Ship Channel	2494	S	NA	S	S	5.0	6.5- 9.0	200	95
Gulf of Mexico	2501	S	NA	NS	S	5.0	6.5- 9.0	14	95

Key: S - segment water quality supports this designated use;  
NS - segment water quality does not support this use;  
NA - this use is not naturally supported by this segment  
DO - Dissolved Oxygen

1 - This segment is listed in the State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for the Development of TMDL

Source: TNRCC, 1996, 1998

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Appendix F - Water Monitoring Stations  
(Texas Gulf Coast)

Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
7	10642	700.0190	ESTURY	AMBNT	701	JEFFERSON	SHALLOW PRONG LAKE ON BIG HILL BAYOU, WESTERNMOST PART NEAR
7	10650	700.0800	STREAM	AMBNT	701	JEFFERSON	BURRELL GULLY, TRIBUTARY TO TAYLOR BAYOU, AT BURRELL-WINGATE ROAD
7	10651	700.0900	STREAM	AMBNT	701	JEFFERSON	MAYHAW BAYOU, TRIBUTARY TO TAYLOR BAYOU, AT SH 73
7	10664	700.4100	STREAM	AMBNT	701	JEFFERSON	RODAIR GULLEY AT SH 365
7	10665	700.4200	STREAM	AMBNT	701	JEFFERSON	RODAIR GULLEY AT CLOVERDALE DRIVE AND 5TH STREET
7	10666	700.4300	STREAM	AMBNT	701	JEFFERSON	RODAIR GULLEY AT US 96
7	10667	701.0010	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU AT SALT WATER BARRIER
7	10668	701.0100	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU AT SH 73 WEST OF PORT ARTHUR
7	10669	701.0200	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU AT LABELLE ROAD
7	10670	701.0300	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU SOUTH FORK AT SH 124
7	10671	701.0350	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU SOUTH FORK AT IH 10
7	10672	701.0370	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU SOUTH FORK AT FM 1406
7	10673	701.0400	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU NORTH FORK AT CRAIGEN ROAD
7	10674	701.0450	STREAM	AMBNT	701	JEFFERSON	TAYLOR BAYOU NORTH FORK AT IH 10
7	15030	NA	CANAL	AMBNT	701	JEFFERSON	MAIN "A" CANAL AT 9TH AVE., 1/2 MI. NORTH OF SH 73
7	15031	NA	CANAL	AMBNT	701	JEFFERSON	MAIN "B" CANAL AT SH 73, 2.4 MI. NE OF INTERCHANGE OF SH 73 AND SH 214
7	10640	700.1280	TDLSTR	AMBNT	702	JEFFERSON	TAYLOR BAYOU APPROX. 1/4 MI. NORTH OF INTRACOASTAL CANAL
7	10641	700.0150	TDLSTR	AMBNT	702	JEFFERSON	TAYLOR BAYOU WEST OF GULF OIL
7	10643	700.0200	TDLSTR	AMBNT	702	JEFFERSON	ALLIGATOR BAYOU AT FM 214
7	10644	700.0300	TDLSTR	AMBNT	702	JEFFERSON	SEA RIM STATE PARK SPECIAL STATION ON SALT BAYOU 1000 FEET SOUTH OF GIWW
7	10645	700.0400	TDLSTR	AMBNT	702	JEFFERSON	SEA RIM STATE PARK SPECIAL STATION ON SALT BAYOU 1 MILE SOUTHWEST OF GIWW
7	10646	700.0500	TDLSTR	AMBNT	702	JEFFERSON	SEA RIM STATE PARK SPECIAL STATION ON SALT BAYOU 1 3/4 MILES SOUTHWEST OF GIWW
7	10647	700.0600	ESTURY	AMBNT	702	JEFFERSON	SEA RIM STATE PARK SPECIAL STATION AT MID SHELL LAKE
7	10648	700.0700	ESTURY	AMBNT	702	JEFFERSON	SEA RIM STATE PARK SPECIAL STATION IN THE LEFT ARM OF KEITH LAKE
7	10649	700.0750	ESTURY	AMBNT	702	JEFFERSON	KEITH LAKE NEAR US 87
7	10652	700.1000	ESTURY	AMBNT	702	JEFFERSON	TAYLOR BAYOU TURNING BASIN AT TEXACO DOCK
7	10653	700.1100	ESTURY	AMBNT	702	JEFFERSON	TAYLOR BAYOU TURNING BASIN AT GULF DOCKS
7	10654	700.1260	ESTURY	AMBNT	702	CHAMBERS	OYSTER BAYOU, 200 M UPSTREAM OF CONFLUENCE WITH EAST BAY
7	10675	702.0100	ESTURY	AMBNT	702	CHAMBERS	INTRACOASTAL WATERWAY SH 124 BRIDGE OVER INTRACOASTAL CANAL AT HIGH ISLAND
7	10676	702.0200	ESTURY	AMBNT	702	JEFFERSON	INTRACOASTAL WATERWAY SEA RIM STATE PARK SPECIAL STATION ON GIWW BELOW SALT BAYOU CONFLUENCE
7	10677	702.0250	ESTURY	AMBNT	702	JEFFERSON	INTRACOASTAL WATERWAY GIWW AT SALT BAYOU CONFLUENCE
7	10678	702.0300	ESTURY	AMBNT	702	JEFFERSON	INTRACOASTAL WATERWAY SEA RIM STATE PARK SPECIAL STATION ON GIWW ABOVE SALT BAYOU CONFLUENCE
7	10679	702.0400	ESTURY	AMBNT	702	JEFFERSON	INTRACOASTAL WATERWAY SEA RIM STATE PARK SPECIAL STATION ON GIWW AT SH 87
7	14408	NA	CANAL	AMBNT	702	JEFFERSON	JEFFERSON COUNTY DRAINAGE CITY OUTFALL CANAL AT 25TH STREET, 0.6 KM NORTH OF SPUR 215
7	14409	NA	TDLSTR	AMBNT	702	JEFFERSON	ALLIGATOR BAYOU IMMEDIATELY DOWNSTREAM OF STAR ENTERPRISES OUTFALL 00414.008, 0.5 KM DOWNSTREAM OF SPUR 215

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Appendix F - Water Monitoring Stations (continued)  
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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
7	14410	NA	TDLSTR	AMBNT	702	JEFFERSON	ALLIGATOR BAYOU IMMEDIATELY DOWNSTREAM OF STAR ENTERPRISE OUTFALL 00414.001, 1.2 KM UPSTREAM OF SH 82
7	14411	NA	CANAL	AMBNT	702	JEFFERSON	JEFFERSON COUNTY DRAINAGE DISTRICT MAIN OUTFAL NO. 7 CANAL ADJACENT TO WEST SIDE OF STAR ENTERPRISE 2.4 KM UPSTREAM OF ALLIGATOR BAYOU
7	14412	NA	CANAL	AMBNT	702	JEFFERSON	MAIN "C" CANAL AT RR 365, 1.8 KM WEST OF US 69/96/287 IN PORT ARTHUR
7	10680	703.0100	ESTURY	AMBNT	703	JEFFERSON	SABINE/NECHES CANAL SEA RIM STATE PARK SPECIAL STATION ON SABINE-NECHES CANAL BELOW KEITH LAKE
7	10681	703.0200	ESTURY	AMBNT	703	JEFFERSON	SABINE/NECHES CANAL SABINE-NECHES CANAL JUST BELOW GULFGATE BRIDGE
7	10682	703.0250	ESTURY	AMBNT	703	JEFFERSON	SABINE/NECHES CANAL AT BURTON SHIP YARD
7	10683	703.0300	ESTURY	AMBNT	703	JEFFERSON	SABINE/NECHES CANAL ADJACENT TO TOPCO DOCKS
7	14460	NA	CANAL	AMBNT	703	JEFFERSON	JEFFERSON COUNTY DRAINAGE DISTRICT MAIN B CANAL AT SH 73, 0.9 KM NORTHEAST OF SPUR 215
7	14521	NA	ESTURY	AMBNT	703	JEFFERSON	SABINE/ NECHES CANAL NORTH OF PLEASURE ISLAND BRIDGE
7	14659	NA	ESTURY	AMBNT	703	JEFFERSON	SABINE /NECHES CANAL NEAR TAYLOR BAYOU
7	15482	NA	CANAL	AMBNT	703	JEFFERSON	MAIN "A" CANAL AT NINTH AVE. IN PORT ARTHUR, APPROX. 1.2 KM NW OF SH 73
7	15488	NA	TDLSTR	AMBNT	703	JEFFERSON	TEXAS BAYOU AT JETTY ROAD .5 MI. SOUTH OF SABINE, NORTH OF TEXAS POINT
7	15489	NA	CANAL	AMBNT	703	JEFFERSON	KEITH LAKE CANAL AT SH 87 IMMEDIATELY UPSTREAM OF THE SABINE-NECHES CANAL
7	10659	700.3500	STREAM	AMBNT	704	JEFFERSON	JOHNS GULLY AT HEBERT ROAD SOUTH OF BEAUMONT
7	10660	700.3600	STREAM	AMBNT	704	JEFFERSON	BAYOU DIN AT LABELLE ROAD SOUTH OF BEAUMONT
7	10661	700.3700	STREAM	AMBNT	704	JEFFERSON	PEVITOT GULLY AT LABELLE ROAD SOUTH OF BEAUMONT
7	10662	700.3800	STREAM	AMBNT	704	JEFFERSON	WILLOW MARSH BAYOU AT FRINT DRIVE IN BEAUMONT
7	10663	700.3850	STREAM	AMBNT	704	JEFFERSON	WILLOW MARSH BAYOU AT US 90 WEST OF BEAUMONT
7	10684	704.3000	STREAM	AMBNT	704	JEFFERSON	HILLEBRANDT BAYOU AT SH 365
7	10685	704.3100	STREAM	AMBNT	704	JEFFERSON	HILLEBRANDT BAYOU AT HILLEBRANDT ROAD NEAR LOVELL LAKE
7	10686	704.3200	STREAM	AMBNT	704	JEFFERSON	HILLEBRANDT BAYOU AT HUMBLE ROAD
7	10687	704.3400	STREAM	AMBNT	704	JEFFERSON	HILLEBRANDT BAYOU AT SH 124
7	15518	NA	CANAL	AMBNT	704	JEFFERSON	DRAINAGE DITCH 0.1 KM EAST OF AMELIA DR. (FM 364) AND 0.4 KM SOUTH OF HALL RD. IN BEAUMONT
9	11109	901.0005	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL AT TRI-CITY BEACH ROAD (FM 2354)
9	11110	901.0025	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL AT SPUR 55
9	11111	901.0030	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL AT ROSELAND PARK BOAT RAMP, 400 METERS UPSTREAM OF SPUR 55
9	11112	901.0040	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL 0.4 MI DOWNSTREAM OF HL&P INTAKE
9	11113	901.0050	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL HL&P CEDAR BAYOU POWER PLANT WATER INTAKE FROM CEDAR BAYOU
9	11114	901.0060	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU 0.4 MI UPSTREAM OF HL&P INTAKE
9	11115	901.0100	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL AT SH 146 NORTHEAST OF BAYTOWN
9	11116	901.0150	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL AT PINEHURST UTILITIES WWTP OUTFALL, 200 M DOWNSTREAM OF MCGEE GULLY

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
9	11117	901.0200	TDLSTR	AMBNT	901	Chambers	CEDAR BAYOU TIDAL IH 10 BRIDGE SOUTH OF MONT BELVIEU
9	11108	900.0350	STREAM	AMBNT	902	Harris	WEST FORK CEDAR BAYOU AT RAMSEY ROAD, 2.5 MI SE OF HUFFMAN
9	11118	902.0065	STREAM	AMBNT	902	Chambers	CEDAR BAYOU AT FM 1942
9	11119	902.0080	STREAM	AMBNT	902	Harris	CEDAR BAYOU AT END OF KENNING ROAD, 5.0 MI EAST OF BARRETT
9	11120	902.0100	STREAM	AMBNT	902	Harris	CEDAR BAYOU AT US 90 NE OF CROSBY
9	11121	902.0120	STREAM	AMBNT	902	Harris	CEDAR BAYOU AT CROSBY-EASTGATE ROAD, 4.1 MI SE OF HUFFMAN
9	11122	902.0160	STREAM	AMBNT	902	Harris	CEDAR BAYOU AT RAMSEY ROAD, 2.4 MI SE OF HUFFMAN
9	11123	902.0180	STREAM	AMBNT	902	Harris	CEDAR BAYOU AT FM1960, 2.0 MI NE OF HUFFMAN
11	11440	1100.1320	CANAL	AMBNT	1101	Galveston	UNNAMED DRAINAGE DITCH 2800 FEET WEST OF MCFARLAND RD
11	11445	1101.0050	TDLSTR	AMBNT	1101	Galveston	CLEAR CREEK TIDAL AT HOUSTON LIGHTING AND POWER WEBSTER POWER PLANT WATER INTAKE
11	11446	1101.0100	TDLSTR	AMBNT	1101	Galveston	CLEAR CREEK TIDAL AT SH 3 NEAR WEBSTER
11	11447	1101.0125	TDLSTR	AMBNT	1101	Harris	CLEAR CREEK TIDAL AT IH 45 EAST OF FRIENDSWOOD
11	11448	1101.0150	TDLSTR	AMBNT	1101	Harris	CLEAR CREEK TIDAL AT FM 528 EAST OF FRIENDSWOOD
11	15458	NA	TDLSTR	AMBNT	1101	Harris	CLEAR CREEK AT EGRET BAY BLVD. (FM 270) SE OF WEBSTER
11	11425	1100.1100	STREAM	AMBNT	1102	Galveston	COWART CREEK AT FM 518
11	11426	1100.1150	STREAM	AMBNT	1102	Brazoria	COWART CREEK AT FM 2351
11	11427	1100.1180	STREAM	AMBNT	1102	Brazoria	COWART CREEK AT COUNTY ROAD 127, APPROX. 400 MI. DOWNSTREAM FROM DIXIE FARM RD.
11	11428	1100.1185	STREAM	AMBNT	1102	Brazoria	COWART CREEK AT AMOCO SERVICE RD, 370 M DOWNSTREAM FROM SH35
11	11429	1100.1190	STREAM	AMBNT	1102	Brazoria	COWART CREEK AT SH35
11	11449	1102.0050	STREAM	AMBNT	1102	Harris	CLEAR CREEK AT FRIENDSWOOD LINK ROAD AT FRIENDSWOOD
11	11450	1102.0100	STREAM	AMBNT	1102	Harris	USGS Gauge Id : 08077540, CLEAR CREEK AT CLEAR LAKE CITY BLVD. (FM2351) NEAR FRIENDSWOOD
11	11451	1102.0150	STREAM	AMBNT	1102	Brazoria	CLEAR CREEK AT LIBERTY/COUNTRY CLUB RD. SE OF PEARLAND
11	11452	1102.0200	STREAM	AMBNT	1102	Brazoria	USGS Gauge Id : 08077000, CLEAR CREEK AT TELEPHONE RD (SH35) IN SOUTH HOUSTON
11	11453	1102.0300	STREAM	AMBNT	1102	Brazoria	CLEAR CREEK AT CULLEN BLVD. (FM 865) WEST OF PEARLAND
11	14229	NA	STREAM	AMBNT	1102	Harris	CLEAR CREEK AT DIXIE FARM ROAD (FM 1959) NEAR FRIENDSWOOD
11	14427	NA	STREAM	AMBNT	1102	Harris	MUD GULLY UPSTREAM OF CLEAR CREEK CONFLUENCE, 0.25 MI. DOWNSTREAM OF DIXIE FARM RD. (CHOATE RD.)
11	14428	NA	STREAM	AMBNT	1102	Harris	MUD GULLY AT SOUTH FORK RD. NORTH OF FRIENDSWOOD
11	15459	NA	STREAM	AMBNT	1102	Harris	CLEAR CREEK AT CHALLENGER 7 PARK, 1.6 MI. UPSTREAM OF IH 45
11	11434	1100.1250	TDLSTR	AMBNT	1103	Galveston	CEDAR CREEK AT FM 517 W OF DICKINSON
11	11435	1100.1260	TDLSTR	AMBNT	1103	Galveston	MAGNOLIA BAYOU AT DEATS RD IN DICKINSON
11	11436	1100.1270	TDLSTR	AMBNT	1103	Galveston	GUM BAYOU AT FM 517 E OF DICKINSON
11	11437	1100.1280	TDLSTR	AMBNT	1103	Galveston	GUM BAYOU AT FM 646 NE OF DICKINSON
11	11444	1100.1360	TDLSTR	AMBNT	1103	Galveston	UNNAMED TRIBUTARY 3400 FT UPSTREAM OF JACK BEAVER RD

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
11	11454	1103.0090	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT CHANNEL MARKER 35 ABOUT 1.5 KM DOWNSTREAM OF SH 146
11	11455	1103.0100	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT SH 146 BRIDGE EAST OF DICKINSON
11	11456	1103.0120	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL 1.2 MI. UPSTREAM OF SH 146
11	11457	1103.0140	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT GUM BAYOU CONFLUENCE
11	11458	1103.0160	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT DICKINSON COUNTRY CLUB
11	11459	1103.0180	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL 200 YARDS DOWNSTREAM OF GH&H RAILROAD BRIDGE
11	11460	1103.0200	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT SH 3 BRIDGE IN DICKINSON
11	11461	1103.0230	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT BENSON BAYOU CONFLUENCE
11	11462	1103.0250	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT IH 45
11	11463	1103.0280	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT FM 646
11	11464	1103.0300	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT ARCADIA-CEMETERY ROAD NORTH OF ARCADIA
11	15469	NA	TDLSTR	AMBNT	1103	Galveston	DICKINSON BAYOU TIDAL AT RETREAT CENTER, 0.8 MI. UPSTREAM OF SH 3 IN DICKINSON
11	11438	1100.1300	CANAL	AMBNT	1104	Galveston	AMERICAN CANAL 5000 FEET EAST OF FM 528 NORTH OF ALVIN
11	11439	1100.1310	STREAM	AMBNT	1104	Galveston	UNNAMED TRIBUTARY EAST OF AMERICAN CANAL NORTHEAST OF ALVIN
11	11441	1100.1330	STREAM	AMBNT	1104	Galveston	ALLIGATOR CREEK 30 FEET UPSTREAM OF CONFLUENCE
11	11442	1100.1340	CANAL	AMBNT	1104	Galveston	UNNAMED DITCH AT INTERSECTION OF ALGOA-FRIENDSWOOD RD AND FM 517
11	11443	1100.1350	STREAM	AMBNT	1104	Galveston	UNNAMED TRIBUTARY ON SOUTH SIDE OF DICKINSON BAYOU 400 FT DOWNSTREAM OF STATION H
11	11465	1104.0060	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT END OF JACK BEAVER RD
11	11466	1104.0080	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT END OF HAPPY HOLLOW RD EAST OF ALVIN
11	11467	1104.0100	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT FM 517 EAST OF ALVIN
11	11468	1104.0200	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT MCFARLAND RD
11	11469	1104.0300	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU ON HIGGINS RANCH NEAR ALVIN
11	11470	1104.0400	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT AMERICAN CANAL CROSSOVER NEAR ALVIN
11	11471	1104.0500	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU EAST OF FM 528 NEAR ALVIN
11	11472	1104.0600	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT FM 528 NORTH OF ALVIN
11	11473	1104.0700	STREAM	AMBNT	1104	Galveston	DICKINSON BAYOU AT MANDALE DRIVE
11	11474	1105.0050	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL IN INTRACOASTAL CANAL AT INTERSECTION OF BAYOU AND BAY
11	11475	1105.0100	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL AT CR 227 NEAR MIMS
11	11476	1105.0200	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL AT SH 288 NORTH OF RICHWOOD VILLAGE
11	11477	1105.0300	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL AT SOUTH FRONT ROAD
11	14441	NA	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL 0.80 KM UPSTREAM FROM GULF INTRACOASTAL WATERWAY, SOUTH OF ALLIGATOR LAKE
11	14442	NA	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL 1.45 KM UPSTREAM FROM CR 227, NORTHWEST OF MIMS
11	14443	NA	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL 0.80 KM DOWNSTREAM FROM BUSINESS SH 288, NORTHEAST OF LAKE JACKSON
11	14647	NA	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL AT COX LAKE
11	14652	NA	TDLSTR	AMBNT	1105	Brazoria	BASTROP BAYOU TIDAL AT LOST LAKE

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
11	11478	1107.0100	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL FM 2004 BRIDGE SOUTH OF ALVIN
11	11479	1107.0300	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL AT AMSTERDAM AT LUTES MARINA
11	11480	1107.0400	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL AT LIVERPOOL
11	11481	1107.0450	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL NORTH OF LIVERPOOL BELOW DAM LOCATED 3 MILES DOWNSTREAM FROM HWY 35, CHOCOLATE BAYOU SURVEY, JUNE 19
11	14444	NA	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL 0.50 KM UPSTREAM FROM FM 2004, WEST OF CHOCOLATE BAY
11	14445	NA	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL 0.80 KM UPSTREAM FROM MOUTH OF PLEASANT BAYOU, NORTH OF AMSTERDAM
11	14446	NA	TDLSTR	AMBNT	1107	Brazoria	CHOCOLATE BAYOU TIDAL 0.80 KM DOWNSTREAM FROM MOUTH OF CHOCOLATE BAYOU RICE CANAL, NORTH OF LIVERPOOL
11	11482	1108.0050	STREAM	AMBNT	1108	Brazoria	CHOCOLATE BAYOU NORTH OF LIVERPOOL ABOVE DAM LOCATED 3 MILES DOWNSTREAM FROM HWY 35, CHOCOLATE SURVEY, JUNE 1984
11	11483	1108.0100	STREAM	AMBNT	1108	Brazoria	CHOCOLATE BAYOU AT SH 35 SOUTHWEST OF ALVIN
11	11484	1108.0200	STREAM	AMBNT	1108	Brazoria	CHOCOLATE BAYOU AT FM 1462 WEST OF ALVIN
11	11485	1109.0100	TDLSTR	AMBNT	1109	Brazoria	OYSTER CREEK TIDAL AT FM 523 SE OF ANGLETON
11	11486	1109.0190	TDLSTR	AMBNT	1109	Brazoria	OYSTER CREEK TIDAL AT THAT-WAY DRIVE, 0.5 MILES BELOW FM 2004
11	11487	1109.0200	TDLSTR	AMBNT	1109	Brazoria	OYSTER CREEK TIDAL AT FM 2004 NORTHWEST OF CLUTE
11	11430	1100.1200	STREAM	AMBNT	1110	Brazoria	UNNAMED DITCH SOUTH OF SH 35, ABOVE CONFLUENCE WITH OYSTER CREEK R
11	11431	1100.1205	STREAM	AMBNT	1110	Brazoria	GOVERNMENT DITCH SE CORNER OF RAMSEY PRISON FARM 1/4 MILE ABOVE CONFL. WITH OYSTER CREEK
11	11432	1100.1210	CANAL	AMBNT	1110	Brazoria	HARRIS RESERVOIR DISCHARGE CANAL
11	11433	1100.1240	STREAM	AMBNT	1110	Brazoria	STYLES BAYOU AT COUNTY ROAD NEAR HOLIDAY LAKES, NORTHWEST OF ANGLETON
11	11488	1110.0020	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK NORTH OF FM 2004 AT DOW PUMPING STATION, NEAR LAKE JACKSON
11	11489	1110.0040	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK AT WALKER ST (CO. ROAD) NEAR WARD LAKE
11	11490	1110.0050	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK AT SH 35 WEST OF ANGLETON
11	11491	1110.0070	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK AT COUNTY RD SOUTH OF HORSESHOE LAKE, WEST OF ANGLETON
11	11492	1110.0090	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK AT COUNTY RD, 1.3 MILES EAST OF HARRIS RESERVOIR
11	11493	1110.0110	STREAM	AMBNT	1110	Brazoria	OYSTER CREEK AT FM 1462 WEST OF ROSHARON
11	11494	1110.0130	STREAM	AMBNT	1110	Fort Bend	OYSTER CREEK AT MILLER RD, 1 MILE WEST OF JULIFF
11	11495	1110.0135	STREAM	AMBNT	1110	Fort Bend	OYSTER CREEK AT SIENNA PLANTATION BRIDGE, 2 MILES SW OF ARCOLA
11	11496	1110.0140	STREAM	AMBNT	1110	Fort Bend	OYSTER CREEK AT FIRST RR BRIDGE ABOVE SIENNA PLANTATION BRIDGE, 2 MILES SW OF ARCOLA
11	11497	1110.0150	STREAM	AMBNT	1110	Fort Bend	OYSTER CREEK AT TRAMMEL FRESNO RD, NEAR SH 6
11	11498	1111.0100	ESTURY	AMBNT	1111	Brazoria	OLD BRAZOS RIVER CHANNEL MID-WAY BETWEEN MOUTH AND TERMINUS
11	11404	1100.0350	TDLSTR	AMBNT	1113	Harris	USGS Gauge Id : 08077620, ARMAND BAYOU AT GENOA-RED BLUFF RD NE OF ELLINGTON AFB
11	11405	1100.0355	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU AT FAIRMONT PARKWAY
11	11406	1100.0370	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU 0.1KM UPSTREAM OF ARMAND BAYOU CONFLUENCE

Appendix F - Water Monitoring Stations (continued)  
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Basin	Station	Station No.	EPA Type 1	EPA Type 2	Segment	County Name	Description
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Id:					Id		
11	11407	1100.0380	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU 1.0KM UPSTREAM OF ARMAND BAYOU CONFLUENCE
11	11408	1100.0390	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU 1.4 KM DOWNSTREAM OF BAY AREA BLVD.
11	11409	1100.0400	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU AT BAY AREA BLVD. NORTH OF NASA
11	11410	1100.0425	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU 0.5 KM UPSTREAM OF BAY AREA BLVD.
11	11411	1100.0450	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU AT ELDORADO BLVD.
11	11412	1100.0475	TDLSTR	AMBNT	1113	Harris	HORSEPEN BAYOU ON DIKE RD. 2.8 KM UPSTREAM OF ELDORADO BLVD.
11	11499	1113.0005	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL AT NASA 1 BRIDGE
11	11500	1113.0020	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL LOWER MUD LAKE 1.4KM UPSTREAM OF NASA 1 BRIDGE
11	11501	1113.0030	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL UPPER MUD LAKE 2.8KM UPSTREAM OF NASA 1 BRIDGE
11	11502	1113.0050	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL 0.4 KM UPSTREAM OF HORSEPEN BAYOU CONFLUENCE
11	11503	1113.0100	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL AT BAY AREA BLVD NORTH OF NASA
11	11504	1113.0150	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL 2.2 KM UPSTREAM OF BAY AREA BOULEVARD
11	11505	1113.0200	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL AT UNNAMED ROAD, 1.1 KM DOWNSTREAM OF SPRING GULLY
11	15455	NA	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL NEAR THE EAST SHORELINE IN MUD LAKE, 1.1 KM UPSTREAM OF NASA ROAD 1
11	15460	NA	TDLSTR	AMBNT	1113	Harris	ARMAND BAYOU TIDAL 0.3 KM DOWNSTREAM OF THE HORSEPEN BAYOU CONFLUENCE
13	12130	1300.0100	CANAL	AMBNT	1301	Brazoria	TEXAS GULF CANAL AT FM 1459
13	12146	1301.0100	TDLSTR	AMBNT	1301	Brazoria	SAN BERNARD RIVER TIDAL AT CHURCHILL BRIDGE (FM 2611)
13	12131	1300.0150	STREAM	AMBNT	1302	Wharton	WEST BERNARD CREEK AT SH 60, 4.8 KM (3 MI), NORTH OF HUNGERFORD
13	12132	1300.0200	STREAM	AMBNT	1302	Austin	EAST BERNARD CREEK AT FM 1093 WEST OF WALLIS
13	12147	1302.0100	STREAM	AMBNT	1302	Fort Bend	USGS Gauge Id : 08117500, SAN BERNARD RIVER BRIDGE AT FM 442 SW OF NEEDVILLE
13	15272	NA	STREAM	AMBNT	1302	Brazoria	SAN BERNARD RIVER AT FM 1301, 7 MI. WEST OF WEST COLUMBIA
13	12137	1300.0710	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT CR 521, 230 METERS UPSTREAM FROM CANEY CREEK CONFLUENCE
13	12138	1300.0715	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT SIMS ROAD, 5.15 KM UPSTREAM OF MOUTH
13	12139	1300.0720	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT UNNAMED CR, 3.63 KM NORTHEAST OF CR 457 NEAR LINNVILLE CHURCH
13	12140	1300.0724	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT PRIVATE ROAD OFF CR 323, 1.3 KM DOWNSTREAM OF MPRR BRIDGE
13	12142	1300.0728	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU 50 M UPSTREAM OF PHILLIPS PETROLEUM CO. OUTFALL 001
13	12143	1300.0730	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT UNNAMED CR (3RD CROSSING) 4.1 KM UPSTREAM FROM CONFLUENCE WITH LITTLE LINNVILLE BAYOU
13	12144	1300.0740	TDLSTR	AMBNT	1304	Matagorda	LITTLE LINNVILLE BAYOU AT UNNAMED CR (2ND CROSSING) 8.3 KM UPSTREAM FROM CONFLUENCE WITH LINNVILLE BAYOU
13	12145	1300.0750	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT SH 35, WEST OF OLD OCEAN
13	12148	1304.0100	TDLSTR	AMBNT	1304	Matagorda	CANEY CREEK TIDAL AT CHAMBLISS RD.
13	12149	1304.0200	TDLSTR	AMBNT	1304	Matagorda	CANEY CREEK TIDAL CANEY CREEK AT UNNAMED CR, 1.07 KM SOUTH OF HAWKINSVILLE
13	12150	1305.0050	TDLSTR	AMBNT	1304	Matagorda	CANEY CREEK AT FM 457 NORTH OF SARGENT
13	12151	1305.0075	TDLSTR	AMBNT	1304	Matagorda	CANEY CREEK AT WOODEN BRIDGE, 200 YARDS BELOW LINVILLE BAYOU CONFLUENCE ADJACENT TO FM 521
13	13548	NA	TDLSTR	AMBNT	1304	Matagorda	LINNVILLE BAYOU AT CR 321, 8.8 KM (5.5 MI.) SOUTHWEST OF SWEENEY

Appendix F - Water Monitoring Stations (continued)  
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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
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13	14426	NA	TDLSTR	AMBNT	1304	Brazoria	LINNVILLE BAYOU AT BUTLER RANCH, 1.2 KM DOWNSTREAM OF RAILROAD CROSSING (2.5 KM DOWNSTREAM OF HASEMA RD.)
13	15950	NA	TDLSTR	AMBNT	1304	Matagorda	CANEY CREEK TIDAL AT CARANCHUA RD. BOAT RAMP, 2KM UPSTREAM OF THE ICWW IN SARGENT, MATAGORDA COUNTY
13	12134	1300.0700	STREAM	AMBNT	1305	Matagorda	HARDEMAN SLOUGH AT SH 35, 1.63 KM NORTHEAST OF VAN VLECK
13	12135	1300.0705	STREAM	AMBNT	1305	Matagorda	HARDEMAN SLOUGH AT COUNTY ROAD NE OF FM 2540 NEAR ALLENHURST COMMUNITY
13	12136	1300.0708	STREAM	AMBNT	1305	Matagorda	RAINEY SLOUGH 20 M UPSTREAM OF MATAGORDA CO. WCID #6 (VAN VLECK) WWTP OUTFALL
13	12141	1300.0726	TDLSTR	AMBNT	1305	Matagorda	LINNVILLE BAYOU AT FM 324 (HASEMA ROAD)
13	12152	1305.0100	STREAM	AMBNT	1305	Matagorda	CANEY CREEK ABOVE TIDAL AT FM 521
13	12153	1305.0150	STREAM	AMBNT	1305	Matagorda	CANEY CREEK AT FM 457 NEAR RUGELEY
13	12154	1305.0175	STREAM	AMBNT	1305	Matagorda	CANEY CREEK AT SH 35, 3.75 KM NE OF VAN VLECK
13	12155	1305.0200	STREAM	AMBNT	1305	Matagorda	CANEY CREEK AT FM 3156, 1.69 KM SOUTHWEST OF CR 1728 AT ASHWOOD
13	15951	NA	STREAM	AMBNT	1305	Matagorda	CANEY CREEK ABOVE TIDAL AT FM457 IN CITY OF CEDAR LANE
15	12515	1501.0100	TDLSTR	AMBNT	1501	Matagorda	TRES PALACIOS CREEK TIDAL AT FM 521 EAST OF PALACIOS
15	15321	NA	TDLSTR	AMBNT	1501	Matagorda	TRES PALACIOS CREEK TIDAL 4.4 KM UPSTREAM OF FM 521, NE OF PALACIOS
15	15322	NA	TDLSTR	AMBNT	1501	Matagorda	TRES PALACIOS CREEK TIDAL 0.8 MI. UPSTREAM OF WILSON CREEK CONFLUENCE, NE OF PALACIOS
15	15323	NA	TDLSTR	AMBNT	1501	Matagorda	TRES PALACIOS CREEK TIDAL AT GRIMES CEMETERY EAST OF BLESSING, 4.5 MI DOWNSTREAM OF SH 35
15	12516	1502.0100	STREAM	AMBNT	1502	Matagorda	TRES PALACIOS CREEK AT SH 35 EAST OF BLESSING
15	12517	1502.0200	STREAM	AMBNT	1502	Matagorda	TRES PALACIOS CREEK AT FM 456 EAST OF MIDFIELD
15	15324	NA	STREAM	AMBNT	1502	Matagorda	JUANITA CREEK AT FM 2431 EAST OF MIDFIELD
15	15325	NA	STREAM	AMBNT	1502	Matagorda	TRES PALACIOS CREEK AT FM 1468 AT CLEMVILLE, 9 MI WEST OF BAY CITY
15	15326	NA	STREAM	AMBNT	1502	Matagorda	TRES PALACIOS CREEK AT 2ND COUNTY ROAD CROSSING NORTH OF CLEMVILLE ON MATAGORDA/WHARTON COUNTY LINE
15	15327	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT CR 418, 7 MI SOUTH OF EL CAMPO
15	15328	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT CR 410, 3 MI SOUTH OF EL CAMPO
15	15329	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT CR 408, 2 MI SOUTH OF EL CAMPO
15	15330	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT CR 406, 1 MI SOUTH OF EL CAMPO
15	15331	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT US 59 IN EL CAMPO
15	15332	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK AT SH 71 IN EL CAMPO
15	15333	NA	PIPE	TREATD	1502	Wharton	CITY OF EL CAMPO WWTP OUTFALL, 10 FT. UPSTREAM OF THE CONFLUENCE WITH TRES PALACIOS CREEK, 2000 FT. UPSTREAM OF US 59 OF EL CAMPO
15	16023	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK IMMEDIATELY UPSTREAM OF SOUTH ST IN EL CAMPO
15	16024	NA	STREAM	AMBNT	1502	Wharton	TRES PALACIOS CREEK IMMEDIATELY UPSTREAM OF WHARTON ST. IN EL CAMPO
15	16025	NA	STREAM	AMBNT	1502	Wharton	UNNAMED TRIBUTARY OF TRES PALACIOS CREEK IMMEDIATELY UPSTREAM OF JACKSON ST. (SH525) AND 1 KM NE OF US 59 IN EL CAMPO

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
17	12535	1701.0100	CANAL	AMBNT	1701	Calhoun	VICTORIA BARGE CANAL IN CANAL AT MARKER 32 NEAR SEADRIFT
17	12536	1701.0200	CANAL	AMBNT	1701	Calhoun	VICTORIA BARGE CANAL AT SH 35 NORTH OF SEADRIFT

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20	12943	2001.0100	TDLSTR	AMBNT	2001	REFUGIO	MISSION RIVER TIDAL AT FM 2678 BRIDGE BETWEEN REFUGIO AND BAYSIDE
20	12944	2002.0100	STREAM	AMBNT	2002	REFUGIO	USGS Id: 08189500, MISSION RIVER AT US 77 UPSTREAM FROM BRIDGE AT REFUGIO
20	12930	2000.0100	TDLSTR	AMBNT	2003	SAN PATRICIO	CHILTIPIN CREEK AT EAST END OF PLYMOUTH RD. NE OF SINTON
20	12945	2003.0100	TDLSTR	AMBNT	2003	ARANSAS	ARANSAS RIVER TIDAL AT FM 136 BRIDGE SOUTH OF BAYSIDE
20	12946	2003.0200	TDLSTR	AMBNT	2003	REFUGIO	ARANSAS RIVER TIDAL NEAR SALT WATER BARRIER 1.9KM UPSTREAM OF CHILTIPIN CREEK CONFLUENCE
20	12931	2000.0180	STREAM	AMBNT	2004	BEE	POESTA CREEK AT FM 673, DOWNTOWN BEEVILLE
20	12932	2000.0200	STREAM	AMBNT	2004	BEE	POESTA CREEK AT US 181 BYPASS (5.2 KM UPSTREAM OF SH 202)
20	12933	2000.0250	STREAM	AMBNT	2004	BEE	POESTA CREEK ON HARRIS RANCH 1.6 KM DOWNSTREAM OF US 181 BYPASS
20	12934	2000.0260	STREAM	AMBNT	2004	BEE	POESTA CREEK ON HITCHCOCK PROPERTY 2.6 KM DOWNSTREAM OF US 181 BYPASS
20	12935	2000.0280	STREAM	AMBNT	2004	BEE	POESTA CREEK ON GREEN PROPERTY 2.0 KM UPSTREAM OF SH 202
20	12936	2000.0300	STREAM	AMBNT	2004	BEE	POESTA CREEK AT HARRIS RANCH 1.1 KM DOWNSTREAM OF US 181 BYPASS
20	12937	2000.0400	STREAM	AMBNT	2004	BEE	POESTA CREEK AT SH 202
20	12938	2000.0450	STREAM	AMBNT	2004	BEE	POESTA CREEK ON WELDER RANCH, WEST OF CHASE FIELD NAS
20	12939	2000.0500	STREAM	AMBNT	2004	BEE	POESTA CREEK ON O'NEILL RANCH 3.5 KM UPSTREAM OF DRY CREEK
20	12940	2000.0510	STREAM	AMBNT	2004	BEE	POESTA CREEK ON HAWS PROPERTY 0.6KM UPSTREAM OF ARANSAS CREEK CONFLUENCE
20	12941	2000.0900	STREAM	AMBNT	2004	BEE	ARANSAS CREEK AT US 181
20	12942	2000.1000	STREAM	AMBNT	2004	BEE	DRY CREEK AT US 181
20	12947	2004.0050	STREAM	AMBNT	2004	REFUGIO	ARANSAS RIVER AT BOAT RAMP ON FM 629 SOUTH OF BONNIE VIEW
20	12948	2004.0100	STREAM	AMBNT	2004	REFUGIO	ARANSAS RIVER AT US 77 BRIDGE BETWEEN WOODSBORO AND SINTON
20	12949	2004.0120	STREAM	AMBNT	2004	REFUGIO	ARANSAS RIVER ON WELDER-MCCANN RANCH 12.5 KM UPSTREAM OF US 77
20	12950	2004.0150	STREAM	AMBNT	2004	BEE	ARANSAS RIVER EAST OF PAPALOTE ON RYAN RANCH ROAD 1.9 KM UPSTREAM OF PAPALOTE CREEK CONFLUENCE
20	12951	2004.0180	STREAM	AMBNT	2004	BEE	ARANSAS RIVER ON RYAN RANCH 0.4 KM UPSTREAM OF MOSS GULLY CONFLUENCE
20	12952	2004.0200	STREAM	AMBNT	2004	BEE	USGS ID: 08189700, ARANSAS RIVER AT COUNTY ROAD EAST OF SKIDMORE
20	12953	2004.0210	STREAM	AMBNT	2004	BEE	ARANSAS RIVER ON BOULOVA PROPERTY 2.6 KM DOWNSTREAM OF POESTA CREEK CONFLUENCE
20	15397	na	ESTURY	AMBNT	2004	REFUGIO	ARANSAS RIVER 0.75 RIVER MI. SOUTH OF US 77, 10 MI. SW OF WOODSBORO
22	13036	2200.0800	TDLSTR	AMBNT	2201	Willacy	NORTH FLOODWAY AT FM 1420 NEAR SANTA MONICA
22	13037	2200.0830	TDLSTR	AMBNT	2201	Hidalgo	NORTH FLOODWAY AT SH 107 NEAR LA VILLA
22	13068	2200.1200	TDLSTR	AMBNT	2201	Cameron	CAYO ATASCOSO, 50 YDS UPSTREAM OF CONFL WITH ARROYO COLORADO
22	13069	2200.1225	TDLSTR	AMBNT	2201	Cameron	CAYO ATASCOSO AT FM 106, SOUTH OF LAGUNA ATASCOSA
22	13070	2201.0090	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.4 KM UPSTREAM FROM INTRACOASTAL WATERWAY
22	13071	2201.0100	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT MILE 10 (MARKER 22)
22	13072	2201.0150	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL FM 106 BRIDGE AT RIO HONDO

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
22	13073	2201.0500	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT CAMP PERRY NORTH OF RIO HONDO
22	13557	NA	TDLSTR	AMBNT	2201	Willacy	ARROYO COLORADO TIDAL 0.25 MI. SOUTH OF THOMAE PARK BOAT RAMP AT MILE 3.5
22	13558	NA	TDLSTR	AMBNT	2201	Willacy	ARROYO COLORADO TIDAL AT MARKER 18 NEAR SHRIMP FARM OUTFALL AT ARROYO CITY

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22	13559	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT MARKER 27 (MILE 15) 0.5 MI. N. OF THE POINT WHERE CHANNEL BECOMES BOUNDARY BETWEEN WILLACY AND CAMERON CO.
22	13782	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL NEAR CM 16 AT ARROYO CITY, KM 10.9
22	14849	NA	ESTURY	AMBNT	2201	Cameron	ARROYO COLORADO AT THE JUNCTION OF CAYO ATASCOSO
22	14850	NA	ESTURY	AMBNT	2201	Cameron	ARROYO COLORADO 1.5 MILES SW OF JUNCTION OF CAYO ATASCOSO
22	14851	NA	ESTURY	AMBNT	2201	Cameron	ARROYO COLORADO AT CM 36
22	14852	NA	ESTURY	AMBNT	2201	Cameron	ARROYO COLORADO AT CM 54 AT THE FIRST HORSESHOE BEND
22	14853	NA	ESTURY	AMBNT	2201	Cameron	ARROYO COLORADO AT CM 73 AT SECOND HORSESHOE BEND
22	15532	NA	CANAL	AMBNT	2201	Cameron	RESACA DEL RANCHO VIEJO AT DANA RD. SW OF RANCHO VIEJO
22	15533	NA	CANAL	AMBNT	2201	Cameron	RESACA DEL RANCHO VIEJO AT ROBINDALE RD. SW OF RANCHO VIEJO
22	15547	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.1 KM UPSTREAM FROM GIWW
22	15548	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 200 M UPSTREAM FROM CONFLUENCE WITH CAYO ATASCOSO, 3.8 KM UPSTREAM FROM GIWW
22	15549	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 0.5 KM UPSTREAM FROM CONFLUENCE WITH CAYO ATASCOSO, 4.0 KM UPSTREAM FROM GIWW
22	15550	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.6 KM DOWNSTREAM FROM CM 18 AND 8.0 KM UPSTREAM FROM GIWW
22	15551	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.45 KM DOWNSTREAM FROM CH 18 AND 8.1 KM UPSTREAM FROM GIWW
22	15552	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT WESTERN BOUNDARY OF LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, 8.6 KM UPSTREAM FROM GIWW
22	15553	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 0.6 KM UPSTREAM FROM CM 18, 10.2 KM UPSTREAM FROM THE MOUTH
22	15554	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT CM 16, 10.4 KM UPSTREAM FROM GIWW
22	15555	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT PAUL BERGH'S BOAT DOCK IN ARROYO CITY, 0.7 KM UPSTREAM FROM CM 16 AND 11.2 KM UPSTREAM FROM GIWW
22	15556	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT CONFLUENCE WITH COMMON CHANNEL FROM HUNG AND TAIWAN SHRIMP FARMS, 11.4 KM UPSTREAM FROM GIWW
22	15557	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.6 KM UPSTREAM FROM CM 36 AND 13.1 KM UPSTREAM FROM GIWW
22	15558	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT HUNG'S SHRIMP FARM INTAKE, 2.3 KM UPSTREAM FROM CM 36 AND 13.8 KM UPSTREAM FROM GIWW
22	15559	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 0.9 KM UPSTREAM FROM CM 54 AND 15.6 KM UPSTREAM FROM GIWW
22	15560	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.4 KM UPSTREAM FROM CM 54 AND 16.1 KM UPSTREAM FROM GIWW
22	15561	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.9 KM UPSTREAM FROM CM 54 AND 16.6 KM UPSTREAM FROM GIWW

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
22	15562	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 0.8 KM UPSTREAM FROM CM 73, EAST OF PASO REAL AND 20.8 KM UPSTREAM FROM GIWW
22	15563	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.6 KM UPSTREAM FROM CM 73, SOUTH OF PASO REAL AND 22.6 KM UPSTREAM FROM GIWW
22	15564	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 300 M UPSTREAM FROM CM 27 AND 24.2 KM UPSTREAM FROM GIWW
22	15565	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.2 KM UPSTREAM FROM CM 27 AND 26.0 KM UPSTREAM FROM

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22	15566	NA	TDLSTR	AMBNT	2201	Cameron	GIWW ARROYO COLORADO TIDAL 4.2 KM UPSTREAM FROM CM 27 AND 27.9 KM UPSTREAM FROM GIWW
22	15567	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 3.4 KM DOWNSTREAM FROM CAMP PERRY AND 30.1 KM UPSTREAM FROM GIWW
22	15568	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.4 KM DOWNSTREAM FROM CAMP PERRY AND 32.0 KM UPSTREAM FROM GIWW
22	15569	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 0.6 KM UPSTREAM FROM CAMP PERRY AND 34.0 KM UPSTREAM FROM GIWW
22	15570	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL ADJACENT TO RIO HONDO WWTP DISCHARGE, 0.8 KM DOWNSTREAM FROM FM 106 AND 36.0 KM UPSTREAM FROM GIWW
22	15571	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL ADJACENT TO RIO HONDO AND HARLINGEN CITY BOUNDARY, 0.9 KM UPSTREAM FROM FM 106 AND 37.7 KM UPSTREAM FROM GIWW
22	15572	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.5 KM DOWNSTREAM FROM LOW WATER BRIDGE AT PORT HARLINGEN AND 40.0 KM UPSTREAM FROM GIWW
22	15574	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 2.6 KM DOWNSTREAM FROM CM 18 AND 7.0 KM UPSTREAM FROM GIWW
22	15575	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 100 M DOWNSTREAM FROM CM 18 AND 9.5 KM UPSTREAM FROM GIWW
22	15576	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 400 M UPSTREAM FROM CM 16 AND 10.8 KM UPSTREAM FROM GIWW
22	15577	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT HUNG/TSV DISCHARGE, NEAR RED BUOY AT EDGE OF CHANNEL AND 11.3 KM UPSTREAM FROM GIWW
22	15578	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 200 M DOWNSTREAM FROM CM 36 AND 11.3 KM UPSTREAM FROM GIWW AT MIDCHANNEL
22	15579	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT ARROYO AQUACULTURE ASSOCIATION INTAKE, 400 M UPSTREAM FROM CM 36 AND 11.9 KM UPSTREAM FROM GIWW AT MIDCHANNEL
22	15580	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 1.5 KM UPSTREAM FROM CM 36 AND 13.0 KM UPSTREAM FROM GIWW
22	15581	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL AT MOUTH OF SAN VICENTE DRAINAGE DITCH, 16.2 KM UPSTREAM FROM GIWW
22	15582	NA	TDLSTR	AMBNT	2201	Cameron	ARROYO COLORADO TIDAL 3.9 KM UPSTREAM FROM CM 54 AND 18.6 KM UPSTREAM FROM GIWW
22	15583	NA	CANAL	AMBNT	2201	Cameron	COUNTY DRAINAGE DITCH 100 M UPSTREAM FROM SOUTHERN STAR INC. SHRIMP FARM WASTEWATER DISCHARGE, ESE OF JUNCTION OF FM 2925 AND FM 1847

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
22	15584	NA	CANAL	AMBNT	2201	Cameron	COUNTY DRAINAGE DITCH OFF OF ARROYO COLORADO AT 11.4 KM MARK, AT POINT WHERE FM 2925 CROSSES DITCH
22	15585	NA	CANAL	AMBNT	2201	Cameron	SAN VICENTE DRNGE DITCH 450M UPSTM OF CONF WITH ARROYO COLORADO (MOUTH OF DITCH IS 0.92KM UPSTREAM FROM CM54 ON ARROYO COLORADO TDL)
22	15586	NA	CANAL	AMBNT	2201	Cameron	CO. DRNGE DITCH AT SE CORNER OF SSI SHRIMP FARM, UPSTM OF THE INFLUENCE OF ALL SHRIMP FARMS & 3.2KM SSE FROM JUNCTION OF FM2925/FM1847
22	15587	NA	CANAL	AMBNT	2201	Cameron	COUNTY DRAINAGE DITCH 5M UPSTRM FROM WASTEWATER DISGH FROM SOUTHERN STAR INC SHRIMP FARM, 1.46KM ESE OF JUNCTION OF FM 2925/FM1847
22	15588	NA	PIPE	TREATD	2201	Cameron	WASTEWATER DISCHARGE FROM SOUTHERN STAR INC SHRIMP FARM, 100M UPSTRM FROM JUNCTION WITH CO. DRNGE DITCH AND 1.3KM DWNSTRM FROM CR1847
22	15589	NA	CANAL	AMBNT	2201	Cameron	COUNTY DRAINAGE DITCH 5M UPSTREAM FROM OUTFALL #002 OF ARROYO AQUACULTURE

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22	15590	NA	PIPE	TREATD	2201	Cameron	ASSOC., 0.54 KM NE OF BOAT BASIN IN ARROYO CITY
22	15591	NA	CANAL	AMBNT	2201	Cameron	WASTEWATER DISCHARGE DITCH FROM ARROYO AQUACULTURE ASSOCIATION OUTFALL #002, 0.5 KM NE OF BOAT BASIN IN ARROYO CITY
22	15592	NA	PIPE	TREATD	2201	Cameron	COUNTY DRAINAGE DITCH 15 M DOWNSTREAM FROM ARROYO AQUACULTURE ASSOC. OUTFALL #002, 0.62 KM NE OF BOAT BASIN IN ARROYO CITY
22	15593	NA	CANAL	AMBNT	2201	Cameron	ARROYO AQUACULTURE ASSOC. WASTEWATER OUTFALL #001, 0.72 KM NE OF BOAT BASIN IN ARROYO CITY, NEAR YELLOW GATE
22	15594	NA	TDLSTR	AMBNT	2201	Cameron	SAN VICENTE DRAINAGE DITCH 120 M UPSTREAM FROM JUNCTION WITH ARROYO COLORADO (RIVER KM 16.2) AND 60 M DOWNSTREAM FROM FM 2925
22	15595	NA	TDLSTR	AMBNT	2201	Cameron	TAIWAN SHRIMP VILLAGE ASSOC INTAKE B, IN BOAT BASIN OFF ARROYO COLORADO AT RIVER KM 11.9, IN FRONT OF SHRIMP FARM INTAKE PUMPS
22	15794	NA	TDLSTR	AMBNT	2201	Willacy	TAIWAN SHRIMP VILLAGE ASSOC INTAKE A, IN MIDDLE OF CHANNEL JOINING ARROYO COLORADO TO BOAT BASIN AT RIVER KM 11.9 IN ARROYO CITY
							ARROYO COLORADO TIDAL 300M UPSTREAM OF CM36 AND 11.8KM OF GIWW, AT MID-CHANNEL
22	13038	2200.0890	STREAM	AMBNT	2202	Cameron	UNNAMED DITCH AT KM 42.7 SOUTH ARROYO COLORADO
22	13039	2200.0900	STREAM	AMBNT	2202	Cameron	UNNAMED DRAINAGE DITCH SW RANGERVILLE RD. KM 59.9 SOUTH ARROYO COLORADO
22	13040	2200.0910	STREAM	AMBNT	2202	Cameron	UNNAMED DRAINAGE DITCH SE FM 800 KM 67.1 SOUTH ARROYO COLORADO
22	13041	2200.0920	STREAM	AMBNT	2202	Cameron	UNNAMED DRAINAGE DITCH KM 73.5 SOUTH ARROYO COLORADO
22	13042	2200.0930	STREAM	AMBNT	2202	Cameron	LA FERIA DITCH KM 76.8 NORTH ARROYO COLORADO
22	13043	2200.0935	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH SE FM 2556 78.2 SOUTH ARROYO COLORADO
22	13044	2200.0940	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH NW FM 2556 KM 78.5 NORTH ARROYO COLORADO
22	13045	2200.0950	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH SE FM 491 KM 83.9 SOUTH ARROYO COLORADO
22	13046	2200.0960	STREAM	AMBNT	2202	Hidalgo	ARROYO ANACUITAS 84.3 KM NORTH ARROYO COLORADO
22	13047	2200.0970	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH KM 87.1 SOUTH ARROYO COLORADO
22	13048	2200.0980	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH KM 88.1 SOUTH ARROYO COLORADO
22	13049	2200.0990	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH AT GATE 110, KM 92.3 NORTH ARROYO COLORADO
22	13050	2200.0995	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT 4.5 MILE RD. EAST OF FM 88 AND SOUTH OF WESLACO
22	13051	2200.1000	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH AT GATE 105, KM 94.1 NORTH ARROYO COLORADO
22	13052	2200.1005	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH SOUTH OF LLANO GRANDE AND 0.2 MI. SW OF FM 1015

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
22	13053	2200.1010	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE DITCH AT GATE 97, KM 98.2 NORTH ARROYO COLORADO
22	13054	2200.1015	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT END OF MIDWAY RD. 1.7 MI. WEST OF FM 88 SOUTH OF WESLACO
22	13055	2200.1020	STREAM	AMBNT	2202	Hidalgo	DONNA DITCH KM 98.8 NORTH ARROYO COLORADO
22	13056	2200.1030	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT GATE 12, KM 102.2 SOUTH ARROYO COLORADO
22	13057	2200.1040	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT GATE 16L, KM 106.6 SOUTH ARROYO COLORADO
22	13058	2200.1050	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT GATE 23L, KM 110.5 SOUTH ARROYO COLORADO
22	13059	2200.1060	STREAM	AMBNT	2202	Hidalgo	ALAMO DITCH KM 113.8 NORTH ARROYO COLORADO
22	13060	2200.1065	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT BORDER RD. EAST OF FM 907 SOUTH OF ALAMO
22	13061	2200.1070	STREAM	AMBNT	2202	Hidalgo	PHARR-SAN JUAN DITCH KM 119.3 NORTH ARROYO COLORADO
22	13062	2200.1080	STREAM	AMBNT	2202	Hidalgo	UNNAMED DRAINAGE PIPE UNDER LEVEE W US 281 KM 122.5 NORTH ARROYO COLORADO
22	13063	2200.1090	STREAM	AMBNT	2202	Hidalgo	AIRPORT DITCH KM 128.8 NORTH TRIBUTARY OF ARROYO COLORADO
22	13064	2200.1095	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH ON SOUTH SIDE OF ARROYO COLORADO, NEAR FM 115 SOUTH OF MCALLEN

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22	13065	2200.1100	STREAM	AMBNT	2202	Hidalgo	MCALLEN GOLF COURSE DRAIN AT KM 131.0 NORTH ARROYO COLORADO
22	13066	2200.1110	STREAM	AMBNT	2202	Hidalgo	UNNAMED DITCH AT KM 131.7 SOUTH TRIBUTARY TO ARROYO COLORADO
22	13067	2200.1120	STREAM	AMBNT	2202	Hidalgo	MISSION DITCH KM 137.7, TRIBUTARY TO ARROYO COLORADO
22	13074	2202.0200	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT LOW WATER BRIDGE AT PORT HARLINGEN
22	13075	2202.0225	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT COUNTY RD SW OF PORT HARLINGEN (KM 45.6)
22	13076	2202.0235	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT FM 801 SE OF HARLINGEN
22	13077	2202.0250	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT LOOP 499 BRIDGE IN HARLINGEN
22	13078	2202.0300	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT COMMERCE ST. IN HARLINGEN
22	13079	2202.0350	STREAM	AMBNT	2202	Cameron	USGS Gauge Id : 08470400, ARROYO COLORADO AT US 77 IN SW HARLINGEN
22	13080	2202.0375	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO AT FM 506 SOUTH OF LA FERIA
22	13081	2202.0600	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO MAIN FLOODWAY IN LLANO GRANDE AT FM 1015 SOUTH OF WESLACO
22	13082	2202.0700	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 493 SOUTH OF DONNA
22	13083	2202.0800	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 907 SOUTH OF ALAMO
22	13084	2202.0900	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT US 281 SOUTH OF PHARR
22	13085	2202.1000	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 2061 SE OF MCALLEN
22	13086	2202.1100	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 336 SOUTH OF MCALLEN
22	13087	2202.1150	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 115 SOUTH OF MCALLEN
22	13088	2202.1200	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 494 WEST OF MCALLEN
22	13089	2202.1300	STREAM	AMBNT	2202	Hidalgo	ARROYO COLORADO AT FM 1016 SOUTH OF MISSION
22	14461	NA	CANAL	AMBNT	2202	Cameron	DRAINAGE DITCH AT MIDLANE DR. AT SOUTH ENTRANCE TO WAL MART IN HARLINGEN
22	14490	NA	CANAL	NTRTMT	2202	Cameron	DRAINAGE DITCH AT CLEVELAND AVE. AND COMMERCE ST. IN HARLINGEN
22	15205	NA	STREAM	AMBNT	2202	Hidalgo	LA CRUZ RESACA FLOODWAY PILOT CHANNEL AT FM 2557 (STEWART ST.), 3 MI. SOUTH OF SAN JUAN
22	15206	NA	CANAL	AMBNT	2202	Cameron	DRAINAGE DITCH AT JEFFERSON AND 25TH STS. IN HARLINGEN
22	15207	NA	CANAL	AMBNT	2202	Cameron	DRAINAGE DITCH AT GLASSCOCK AND BLUEBONNET STS. IN HARLINGEN
22	15208	NA	STREAM	AMBNT	2202	Cameron	RESACA DE LOS FRESNOS AT SAM HOUSTON BLVD. AND LAKE SHORE DR. IN SAN BENITO
22	15544	NA	CANAL	AMBNT	2202	Hidalgo	IRRIGATION CANAL AT CAGE BLVD. (US 281) IN PHARR

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Basin	Station Id:	Station No.	EPA Type 1	EPA Type 2	Segment Id	County Name	Description
22	15573	NA	STREAM	AMBNT	2202	Cameron	ARROYO COLORADO 450 M UPSTREAM FROM LOW WATER BRIDGE AT PORT HARLINGEN, 41.7 KM UPSTREAM FROM GIWW
22	13090	2203.0100	TDLSTR	AMBNT	2203	Nueces	PETRONILA CREEK 1.2 KM UPSTREAM OF THE CONFLUENCE WITH TUNAS CREEK
22	13091	2203.0280	TDLSTR	AMBNT	2203	Nueces	PETRONILA CREEK AT CR 51 ON KING RANCH, JUST SOUTH OF THE LAURELS HEADQUARTERS
22	13030	2200.0385	STREAM	AMBNT	2204	Nueces	UNNAMED TRIBUTARY TO PETRONILLA CREEK AT FM 70 NEAR STANOLIND-LUBY CAMP REFINERY
22	13032	2200.0395	STREAM	AMBNT	2204	Nueces	UNNAMED DRAINAGE DITCH TRIBUTARY TO PETRONILLA CREEK AT BEATTY RD, ENTERS PETRONILLA CR 2 MI. DOWNSTREAM OF FM 665
22	13092	2204.0290	STREAM	AMBNT	2204	Kleberg	PETRONILA CREEK 2.3 MI. ABOVE BRIDGE AT CR 51 ON KING RANCH, JUST SOUTH OF THE LAURELS HEADQUARTERS
22	13093	2204.0300	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT FM 70 EAST OF BISHOP
22	13094	2204.0330	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT FM 892 SE OF DRISCOLL
22	13095	2204.0335	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT BEATTY RD., 2.5 MI. DOWNSTREAM OF FM 665
22	13096	2204.0340	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT FM 665 EAST OF DRISCOLL
22	13097	2204.0348	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK 1/4 MI. DOWNSTREAM OF US 77, BELOW DRISCOLL PETROLEUM OUTFALL PIPE
22	13098	2204.0350	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT US 77 BRIDGE
22	13099	2204.0370	STREAM	AMBNT	2204	Nueces	PETRONILA CREEK AT FM 2826 NORTH OF DRISCOLL
7	10657	700.1390	TDLSTR	AMBNT	2422	CHAMBERS	DOUBLE BAYOU WEST FORK AT EAGLE FERRY RD, SOUTH OF ANAHUAC
7	10658	700.1500	TDLSTR	AMBNT	2422	CHAMBERS	DOUBLE BAYOU EAST FORK AT FM 562, SE OF ANAHUAC
7	10655	700.1270	ESTURY	AMBNT	2423	CHAMBERS	OYSTER BAYOU, 5 KM UPSTREAM OF CONFLUENCE WITH EAST BAY
7	10656	700.1280	TDLSTR	AMBNT	2423	CHAMBERS	OYSTER BAYOU AT FM 1985, SE OF ANAHUAC
11	11415	1100.0500	TDLSTR	AMBNT	2424	Galveston	HIGHLAND BAYOU AT FAIRWOOD ROAD
11	11416	1100.0550	ESTURY	AMBNT	2424	Galveston	CARANCAHUA LAKE(SOUTH LAKE), NEAR MIDDLE OF LAKE
11	11417	1100.0555	ESTURY	AMBNT	2424	Galveston	CARANCAHUA BAYOU, 0.5 MI UPSTREAM FROM INTRACOASTAL WATERWAY
11	11418	1100.0557	ESTURY	AMBNT	2424	Galveston	CARANCAHUA LAKE(NORTH LAKE), NEAR MIDDLE OF LAKE
11	11419	1100.0560	ESTURY	AMBNT	2424	Galveston	CARANCAHUA LAKE(WEST LAKE), NEAR MIDDLE OF LAKE
11	11420	1100.0565	ESTURY	AMBNT	2424	Galveston	MCGINNES BARGE CANAL, 0.7 MI. UPSTREAM FROM INTRACOASTAL WATERWAY, NEAR WEST END OF CANAL
11	11421	1100.0568	ESTURY	AMBNT	2424	Galveston	MCGINNES BARGE CANAL, 0.4 MI. UPSTREAM FROM INTRACOASTAL WATERWAY
11	11424	1100.1000	ESTURY	AMBNT	2424	Galveston	GREENS LAKE, MID-LAKE, 0.6 MI. NW OF MOUTH OF GREENS LAKE R
11	11401	1100.0200	TDLSTR	AMBNT	2425	Harris	TAYLOR BAYOU AT PORT RD. NW OF SEABROOK
11	11402	1100.0300	TDLSTR	AMBNT	2425	Harris	BIG ISLAND SLOUGH AT RED BLUFF RD.
11	11403	1100.0325	TDLSTR	AMBNT	2425	Harris	BIG ISLAND SLOUGH AT FAIRMONT PKWY.
11	11413	1100.0480	TDLSTR	AMBNT	2425	Harris	SPRING GULLY AT RED BLUFF RD.

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11	11414	1100.0490	TDLSTR	AMBNT	2425	Harris	WILLOW SPRING GULLY AT RED BLUFF RD.
9	11090	900.0010	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT SH 146 IN BAYTOWN
9	11091	900.0020	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT WEST MAIN ST. IN BAYTOWN
9	11092	900.0030	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT MARKET ST. IN BAYTOWN
9	11093	900.0035	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK, 0.4 RIVER MI. UPSTREAM FROM MARKET ST. IN BAYTOWN
9	11094	900.0040	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT WEST TEXAS AVE. IN BAYTOWN
9	11095	900.0050	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT DECKER DR IN BAYTOWN
9	11096	900.0060	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT PIPELINE CROSSING, 1.3 RIVER MI. UPSTREAM FROM PARK AVE. IN BAYTOWN
9	11097	900.0063	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK EAST FORK, 20 M UPSTREAM FROM CONFLUENCE WITH GOOSE CREEK IN BAYTOWN
9	11098	900.0065	TDLSTR	AMBNT	2426	Harris	EAST FORK GOOSE CREEK AT GARTH RD. IN BAYTOWN
9	11099	900.0067	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK WEST FORK AT DECKER RD. NEAR BAYTOWN
9	11100	900.0070	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT BAKER RD. IN BAYTOWN
9	11101	900.0080	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT LYNCHBURG - CEDAR BAYOU RD., NORTH OF BAYTOWN
9	11102	900.0100	TDLSTR	AMBNT	2426	Harris	GOOSE CREEK AT IH 10 SE OF MCNAIR
9	11103	900.0200	RESERV	AMBNT	2426	Harris	HIGHLANDS RESERVOIR, NEAR MIDDLE OF SOUTH SHORE
9	11104	900.0300	TDLSTR	AMBNT	2426	Harris	SMITH GULLY AT SH 146
9	11105	900.0320	TDLSTR	AMBNT	2426	Harris	MCGEE GULLY AT NEEDLE POINT RD., 360 M SOUTH OF IH10 AND 390 M EAST OF SJOLANDER RD
9	11106	900.0330	TDLSTR	AMBNT	2426	Harris	PINE GULLY AT TRI-CITY BEACH ROAD (FM 2354)
9	11107	900.0340	TDLSTR	AMBNT	2426	Harris	CEDAR BAYOU CUT-OFF CHANNEL AT TRI-CITY BEACH ROAD (FM 2354)
11	11400	1100.0100	TDLSTR	AMBNT	2431	Galveston	MOSES BAYOU AT SH 146 BRIDGE NORTH OF LA MARQUE
11	11422	1100.0610	TDLSTR	AMBNT	2432	Brazoria	HALLS BAYOU AT FM 2004 SW OF ALTO LOMA
11	11423	1100.0680	TDLSTR	AMBNT	2432	Brazoria	MUSTANG BAYOU AT FM 2917, SOUTH OF ALVIN
13	12133	1300.0675	TDLSTR	AMBNT	2441	Matagorda	TRIBUTARY OF LIVE OAK BAYOU AT FM 2540, 4.0 MI. SOUTH OF INTERSECTION WITH FM 457, SE OF BAY CITY
15	14395	NA	ESTURY	AMBNT	2452	Calhoun	TRES PALACIOS SOUTHEAST OF OLIVER POINT LOCATED IN NEAR SHORE AREA WEST OF A WHITE SIGN LOCATED ON OLIVER POINT AREA
15	14394	NA	ESTURY	AMBNT	2453	Calhoun	LAVACA BAY AT ALCOA CHANNEL, REEFS LOCATED IN SHALLOWS OF WEST SHORELINE IN ALCOA CHANNEL
17	12533	1700.0100	ESTURY	AMBNT	2453	Calhoun	CHOCOLATE BAYOU AT SH 35 SW OF PORT LAVACA
17	12534	1700.0300	ESTURY	AMBNT	2453	Calhoun	LYNNS BAYOU BASIN
17	14388	NA	ESTURY	AMBNT	2453	Calhoun	LAVACA BAY SOUTHWEST OF SANDPOINT/NORTHEAST OF LAVACA/MATAGORDA CM #52, REEF LOCATED IN SHALLOW/SPOIL AREA NORTHEAST OF CM #52

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15	12514	1500.0100	RESERV	AMBNT	2454	Calhoun	COX LAKE AT SH 35 NORTH OF POINT COMFORT
15	13689	NA	TDLSTR	AMBNT	2456	Matagorda	USGS Gauge Id : 08162700, EAST CARANCAHUA CREEK AT FM 616, 4.2 MI. WEST OF BLESSING, 100 FT. DOWNSTREAM FROM RR BRIDGE
15	14389	NA	ESTURY	AMBNT	2456	Calhoun	CARANCAHUA BAY AT WEST SIDE OF MOUTH REEF EXTENDS SE DIRECTLY OFF THE POINT OF WEST ENTRANCE TO CARANCAHUA BAY
17	14390	NA	ESTURY	AMBNT	2461	Calhoun	ESPIRITU SANTO BAY AT EAST MOUTH OF SOUTH PASS AT WEST END OF ESPIRITU SANTO BAY, REEFS LOCATED IN SHALLOW AT EAST MOUTH OF SOUTH PASS
17	14387	NA	ESTURY	AMBNT	2462	Calhoun	SAN ANTONIO BAY SSW OF ICWW CM #29 AT SHELL REEF LOCATED IN SHALLOW AROUND REEF, SMALL ISLE WITH A PLATFORM
17	14391	NA	ESTURY	AMBNT	2462	Calhoun	SAN ANTONIO BAY AT ICWW CM 16, REEFS LOCATED AT SPOIL BANKS JUST SOUTHEAST OF CM 16
17	14392	NA	ESTURY	AMBNT	2462	Calhoun	SAN ANTONIO BAY JUST NORTHWEST OF PANTHER POINT, REEF EXTENDS NORTHWEST FROM PANTHER POINT INTO SAN ANTONIO BAY
20	14396	na	ESTURY	AMBNT	2463	ARANSAS	MESQUITE AT SHALLOWS ON EAST SIDE BAY, REEFS LOCATED IN SHALLOWS NORTHWEST OF NORTH POINT OF BRAY COVE
20	13660	na	TDLSTR	AMBNT	2472	REFUGIO	USGS GUAGE Id. Num: 08189200, COPANO CREEK 8.1 MI. EAST OF REFUGIO AT FM 774
20	14393	na	ESTURY	AMBNT	2473	ARANSAS	ST. CHARLES BAY AT MOUTH, REEFS LOCATED JUST SOUTH OF BLACK JACK POINT
22	13780	NA	ESTURY	AMBNT	2481	Nueces	CORPUS CHRISTI HARBOR AT BOAT LAUNCH ON COOPER'S ALLEY L-HEAD
22	14959	NA	ESTURY	AMBNT	2481	San Patricio	CORPUS CHRISTI BAY AT INDIAN POINT PIER IMMEDIATELY SOUTH OF THE CITY OF PORTLAND AT US 181
20	13779	na	ESTURY	AMBNT	2483		PORT ARANSAS MUNICIPAL HARBOR AT PUBLIC BOAT LAUNCH
22	13026	2200.0100	ESTURY	AMBNT	2485	Nueces	CAYO DEL OSO AT YORKTOWN BRIDGE IN CORPUS CHRISTI
22	13027	2200.0150	TDLSTR	AMBNT	2485	Nueces	OSO CREEK AT FM 2444 SOUTH OF CORPUS CHRISTI
22	13028	2200.0200	TDLSTR	AMBNT	2485	Nueces	OSO CREEK AT SH 286 SOUTH OF CORPUS CHRISTI
22	13029	2200.0210	TDLSTR	AMBNT	2485	Nueces	OSO CREEK AT FM 763 SW OF CORPUS CHRISTI
22	13031	2200.0390	TDLSTR	AMBNT	2492	Kleberg	SAN FERNANDO CREEK AT DR. HUBERT PROPERTY, 2 MI. DOWNSTREAM FROM AIRPORT NEAR INTERSECTION OF CR 2090 AND 1080
22	13033	2200.0400	TDLSTR	AMBNT	2492	Kleberg	SAN FERNANDO CREEK AT US 77 BYPASS BRIDGE AT KINGSVILLE
22	13034	2200.0450	TDLSTR	AMBNT	2492	Kleberg	LOS OLMOS CREEK AT US 77 SOUTH OF RIVIERA
22	13035	2200.0500	TDLSTR	AMBNT	2492	Brooks	LOS OLMOS CREEK AT FM 285, EAST OF FALFURRIAS
22	15968	NA	TDLSTR	AMBNT	2492	Kleberg	SAN FERNANDO CREEK 0.7KM DOWNSTREAM OF FM2045 NEAR THE NORTHEAST CORNER OF THE KINGSVILLE NAVAL AIR STATION

Appendix F - Water Monitoring Stations (continued)  
(Texas Gulf Coast)

Basin	Station	Station No.	EPA Type 1	EPA Type 2	Segment	County Name	Description
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Id:					Id		
22	15969	NA	TDLSTR	AMBNT	2492	Kleberg	SAN FERNANDO CREEK AT FM2045, 2.25 MI. EAST OF KINGSVILLE
22	15970	NA	STREAM	AMBNT	2492	Kleberg	SAN FERNANDO CREEK IMMEDIATELY UPSTREAM OF CELANESE CHEMICAL PLANT OUTFALL, 1KM NORTH OF SH428, NE OF KINGSVILLE
22	15971	NA	TDLSTR	AMBNT	2492	Kleberg	SANTA GERTRUTIS CREEK AT KLEBERG CR1070, 0.4 MI. NORTH OF FM1717, 4.5 MI. SE OF KINGSVILLE
22	15972	NA	TDLSTR	AMBNT	2492	Kleberg	SANTA GERTRUTIS CREEK AT FM1717, 3 MI. SE OF KINGSVILLE
22	15973	NA	STREAM	AMBNT	2492	Kleberg	TRANQUITAS CREEK 0.5KM UPSTREAM OF CONFLUENCE WITH SAN FERNANDO CREEK AT THE NORTH SIDE OF THE KINGSVILLE NAVAL AIR STATION
22	15974	NA	STREAM	AMBNT	2492	Kleberg	TRANQUITAS CREEK AT US77 BYPASS IN KINGSVILLE
22	15975	NA	STREAM	AMBNT	2492	Jim Wells	SAN FERNANDO CREEK AT FM1930, 5.0 MI. SE OF ALICE IN JIM WELLS COUNTY
22	15976	NA	STREAM	AMBNT	2492	Jim Wells	SAN FERNANDO CREEK AT FM665, 5.0 MI. EAST OF ALICE IN JIM WELLS COUNTY
22	15977	NA	STREAM	AMBNT	2492	Jim Wells	SAN FERNANDO CREEK AT SH44, 1.0 MI. NE OF ALICE IN JIM WELLS COUNTY

Appendix G - List of Common/Scientific Names  
(Texas Gulf Coast)

**PLANTS**

Agarito/*Berberis trifoliolata*  
Alligator weed/*Alternanthera philoxeroides*  
Allthorn/*Koeberlinia spinosa*  
American beautyberry/*Callicarpa americana*  
American elm/*Ulmus americana*  
American hornbeam/*Carpinus caroliniana*  
Arrowhead/*Sagittaria* spp.  
Baccharis/*Baccharis* spp.  
Bald cypress/*Taxodium distichum*  
Beach morningglory/*Ipomoea stolonifera*  
Beaked panicum/*Panicum anceps*  
Beech/*Fagus grandifolia*  
Beggar-ticks/*Bidens discoidea*  
Berlandier wolfberry/*Lycium berlandieri* var.  
*berlandieri*  
Bermudagrass/*Cynodon dactylon*  
Big cordgrass/*Spartina cynosuroides*  
Black hickory/*Carya texana*  
Black mangrove/*Avicennia germinans*  
Black rush/*Juncus roemerianus*  
Black willow/*Salix nigra*  
Blackberry/*Rubus louisianus*  
Blackbrush/*Acacia rigidula*  
Blackgum/*Nyssa sylvatica*  
Blackjack oak/*Quercus marilandica*  
Bladderwort/*Utricularia* spp.  
Blueberry/*Vaccinium* spp.  
Bluewood/*Condalia hookeri*  
Bog hemp/*Boehmeria cylindrica*  
Broomsedge bluestem/*Andropogon virginicus*  
Brownseed paspalum/*Paspalum plicatulum*  
Buffalograss/*Buchloe dactyloides*  
Bull nettle/*Cnidoscolus texanus*  
Bulrush/*Scirpus* spp.  
Bush palmetto/*Sabal minor*  
Bushsunflower/*Simisia calva*  
Bushy bluestem/*Andropogon glomeratus*  
Buttonbush/*Cephalanthus occidentalis*  
Cabomba/*Cabomba caroliniana*  
California bulrush/*Scirpus californicus*  
Canada wildrye/*Elymus canadensis*

**PLANTS (Continued)**

Carolina ash/*Fraxinus caroliniana*  
Catclaw/*Acacia greggii*  
Cattail/*Typha* spp.  
Cedar elm/*Ulmus crassifolia*  
Cenicilla/*Sesuvium portulacastrum*  
Cenzia/*Leucophyllum frutescens*  
Cherrybark oak/*Quercus falcata* var. *pogodaefoli*  
Climbing hempweed/*Mikania scandens*  
Coldenia/*Coldenia* spp.  
Common elderberry/*Sambucus canadensis*  
Common reed/*Phragmites communis*  
Coontail/*Ceratophyllum demersum*  
Coral-berry/*Symphoricarpos orbiculatus*  
Cottonwood/*Populus deltoides*  
Coyotillo/*Karwinskia humboldtiana*  
Creosotebush/*Larrea tridentata*  
Crinkleawn/*Trachypogon secundus*  
Crossvine/*Bignonia capreolata*  
Croton/*Croton* spp.  
Dayflower/*Commelina* spp.  
Desert olive/*Forestiera angustifolia*  
Desert yaupon/*Schaefferia cuneifolia*  
Dewberry/*Rubus* spp.  
Dogweed/*Dyssodia pentachaeta* var. *pentachaeta*  
Duckweed/*Lemna* spp.  
Eardrop vine/*Brunnichia ovata*  
Eastern red cedar/*Juniperus virginiana*  
Elm/*Ulmus* spp.  
Field ragweed/*Ambrosia confertiflora*  
Firewheel/*Gaillardia* spp.  
Flatsedge/*Cyperus* spp.  
Flowering dogwood/*Cornus florida*  
Fringed signalgrass/*Brachiaria ciliatissima*  
Frostweed/*Verbesina virginica*  
Glasswort/*Salicornia* spp.  
Goatbush/*Castela texana*  
Goatfoot morningglory/*Ipomoea pes-caprae*  
Granjeno/*Celtis pallida*  
Greenbriar/*Smilax* spp.  
Guajillo/*Acacia berlandieri*  
Guayacan/*Porlieria angustifolia*  
Hackberry/*Celtis* spp.  
Hairy grama/*Bouteloua hirsuta*  
Hairy tridens/*Erioneuron pilosum*  
Halls panic/*Panicum hallii*

**PLANTS (Continued)**

Hawthorn/*Crataegus* spp.  
Holly/*Ilex* spp.  
Hooded windmillgrass/*Chloris culcullata*  
Huisache/*Acacia farnesiana*  
Huisachillo/*Acacia tortuosa*  
Johnsongrass/*Sorghum halepense*  
Knotweed leafflower/*Phyllanthus polygonoides*  
Leafy-three-square/*Scirpus robustus*  
Lime pricklyash/*Zanthoxylum fagara*  
Lindheimer tephrosia/*Tephrosia lindheimeri*  
Little bluestem/*Schizachyrium scoparium* var. *frequens*  
Live oak/*Quercus virginiana*  
Loblolly pine/*Pinus taeda*  
Longleaf pine/*Pinus palustris*  
Lotebush/*Ziziphus obtusifolia*  
Macartney rose/*Rosa bracteata*  
Maidencane/*Panicum hemitomon*  
Marsh saltgrass/*Distichlis spicata* var. *spicata*  
Marshay cordgrass/*Spartina patens*  
Mat euphorbia/*Euphorbia serpens*  
Mesquite/*Prosopis glandulosa*  
Mustang grape/*Vitis mustangensis*  
Olneyi three-square/*Scirpus olneyi*  
Overcup oak/*Quercus lyrata*  
Pan American balsamscale/*Elyonurus tripsacoides*  
Pecan/*Carya illinoensis*  
Pickerelweed/*Pontederia cordata*  
Pink pappusgrass/*Pappophorum bicolor*  
Poison oak/*Rhus toxicodendron*  
Possumhaw/*Ilex decidua*  
Post oak/*Quercus stellata*  
Purple three-awn/*Aristida purpurea*  
Red bay/*Persea borbonia*  
Red maple/*Acer rubrum*  
Rescuegrass/*Bromus unioloides*  
Rhomboid copperleaf/*Acalypha rhomboidea*  
Roemer three-awn/*Aristida roemeriana*  
Sacahuista/*Spartina spartinae*  
Sand lovegrass/*Eragrostis trichodes*  
Sand post oak/*Quercus margaretta*  
Sandjack oak/*Quercus incana*  
Sassafras/*Sassafras albidum*  
Sea ox-eye/*Borrchia frutescens*  
Sea purslane/*Sesuvium maritimum*  
Sea rocket/*Cakile fusiformis*  
Seacoast bluestem/*Schizachyrium scoparium* var. *littoralis*  
Sea oats/*Uniola paniculata*

**PLANTS (Continued)**

Seashore paspalum/*Paspalum vaginatum*  
Sensitive briar/*Schrankia* spp.  
Shoalgrass/*Halodule beaudettei*  
Shortleaf pine/*Pinus echinata*  
Shrubby oxalis/*Oxalis berlandieri*  
Silver bluestem/*Bothriochloa saccharoides*  
Silverleaf nightshade/*Solanum elaeagnifolium*  
Silverleaf sunflower/*Helianthus argophyllus*  
Single-spike paspalum/*Paspalum monostachyum*  
Slender bluestem/*Schizachyrium tenerum*  
Slender evolvulus/*Evolvulus alsinoides*  
Slim tridens/*Tridens muticus* var. *muticus*  
Slim lobe poppymallow/*Callirhoe involucrata* var. *linifolia*  
Smooth cordgrass/*Spartina alterniflora*  
Smutgrass/*Sporobolus indicus*  
Southern arrowwood/*Viburnum dentatum*  
Southern dewberry/*Rubus trivialis*  
Southern magnolia/*Magnolia grandiflora*  
Southern red oak/*Quercus flacata*  
Spranglegrass/*Chasmanthium sessiliflorum*  
St. Andrew's cross/*Ascyrum hyppericoides*  
St. John's-wort/*Hypericum walteri*  
Sumac/*Rhus* spp.  
Supplejack/*Berchemia scandens*  
Swamp blackgum/*Nyssa sylvatica* var. *biflora*  
Swamp laurel oak/*Quercus laurifolia*  
Swamp privet/*Foresteria acuminata*  
Sweetgum/*Liquidambar styraciflua*  
Sycamore/*Platanus occidentalis*  
Tanglehead/*Heteropogon contortus*  
Tasajillo/*Opuntia leptocaulis*  
Texas colubrina/*Colubrina texensis*  
Texas lantana/*Lantana horrida*  
Texas pricklypear/*Opuntia lindheimeri*  
Three-awn/*Aristida* spp.  
Tickclover/*Desmodium* spp.  
Trumpet creeper/*Campsis radicans*  
Tumble lovegrass/*Eragrostis sessilisipica*  
Two-leaved senna/*Cassia roemeriana*  
Vidrillos/*Batis maritima*  
Virgin's bower/*Clematis virginiana*  
Virginia creeper/*Parthenocissus quinquefolia*  
Virginia wildrye/*Elymus virginicus*  
Water elm/*Planera aquatica*  
Water fern/*Azolla caroliniana*  
Water hickory/*Carya aquatica*  
Water hyacinth/*Eichornia crassipes*  
Water oak/*Quercus nigra*

## PLANTS (Continued)

Water paspalum/*Paspalum fluitans*  
Water tupelo/*Nyssa aquatica*  
Water-pennywort/*Hydrocotyle* spp.  
Wax myrtle/*Myrica cerifera*  
Western ragweed/*Ambrosia psilostachya*  
White oak/*Quercus alba*  
White waterlily/*Nymphaea odorata*  
Whitebush/*Aloysia gratissima*  
Widgeongrass/*Ruppia maritima*  
Willow oak/*Quercus phellos*  
Windmillgrass/*Chloris* spp.  
Winged elm/*Ulmus alata*  
Woodsorrel/*Oxalis* spp.  
Woollybucket bumelia/*Bumelia lanuginosa*  
Yaupon/*Ilex vomitoria*  
Yellow jessamine/*Gelsemium sempervirens*

## BIRDS

Acadian flycatcher/*Empidonax virescens*  
Acorn woodpecker/*Melanerpes formicivorus*  
Alder flycatcher/*Empidonax alnorum*  
Altamira oriole/*Icterus gularis*  
American avocet/*Recurvirostris americana*  
American bittern/*Botaurus lentiginosus*  
American black duck/*Anas rubripes*  
American coot/*Fulica americana*  
American crow/*Corvus brachyrhychos*  
American golden-plover/*Pluvialis dominica*  
American goldfinch/*Carduelis tristis*  
American kestrel/*Falco sparverius*  
American oystercatcher/*Haematopus palliatus*  
American pipit/*Anthus spinoletta*  
American redstart/*Setophaga ruticilla*  
American robin/*Turdus migratorius*  
American swallow-tailed kite/*Elanoides forficatus*  
American tree sparrow/*Spizella arborea*  
American white pelican/*Pelecanus erythrorhynchos*  
American wigeon/*Anas americana*  
American woodcock/*Scolopax minor*  
Anhinga/*Anhinga anhinga*  
Anna's hummingbird/*Calypte anna*  
Aplomado falcon/*Falco femoralis*  
Arctic tern/*Sterna paradisaea*  
Ash-throated flycatcher/*Myiarchus cinerascens*  
Audubon's oriole/*Icterus graduacauda*  
Bachman's sparrow/*Aimophila aestivalis*  
Baird's sandpiper/*Calidris bairdi*  
Baird's sparrow/*Ammodramus bairdii*

## BIRDS (Continued)

Bald eagle/*Haliaeetus leucocephalus*  
Band-tailed pigeon/*Columba fasciata*  
Bank swallow/*Riparia riparia*  
Barn swallow/*Hirundo rustica*  
Barred owl/*Strix varia*  
Barrow's goldeneye/*Bucephala islandica*  
Bay-breasted warbler/*Dendroica castanea*  
Bell's vireo/*Vireo bellii*  
Belted kingfisher/*Ceryle alcyon*  
Bewick's wren/*Thryomanes bewickii*  
Black noddy/*Anous minutus*  
Black phoebe/*Sayornis nigricans*  
Black rail/*Laterallus jamaicensis*  
Black scoter/*Melanitta nigra*  
Black skimmer/*Rynchops niger*  
Black tern/*Chidonia niger*  
Black vulture/*Coragyps atratus*  
Black-and-white warbler/*Mniotilta varia*  
Black-bellied plover/*Pluvialis squatarola*  
Black-bellied whistling duck/*Dendrocygna autumnalis*  
Black-billed cuckoo/*Coccyzus erythrophthalmus*  
Black-capped vireo/*Vireo atricapillus*  
Black-chinned hummingbird/*Archilochus alexandri*  
Black-crested titmouse/*Parus bicolor*  
Black-crowned night heron/*Nycticorax nycticorax*  
Black-headed grosbeak/*Pheucticus melanocephalus*  
Black-legged kittiwake/*Rissa tridactyla*  
Black-necked stilt/*Himantopus mexicanus*  
Black-shouldered kite/*Elanus caeruleus*  
Black-tailed gnatcatcher/*Poliophtila melanura*  
Black-throated blue warbler/*Dendroica caerulescens*  
Black-throated gray warbler/*Dendroica nigrescens*  
Black-throated green warbler/*Dendroica virens*  
Black-throated sparrow/*Amphispiza bilineata*  
Black-vented oriole/*Icterus wagleri*  
Black-whiskered vireo/*Vireo altiloquus*  
Blackburnian warbler/*Dendroica fusca*  
Blackpoll warbler/*Dendroica striata*  
Blue grosbeak/*Guiraca caerulea*  
Blue jay/*Cyanocitta cristata*  
Blue-gray gnatcatcher/*Poliophtila caerulea*  
Blue-throated hummingbird/*Lampornis clemenciae*  
Blue-winged teal/*Anas discors*  
Blue-winged warbler/*Vermivora pinus*  
Boat-tailed grackle/*Quiscalus major*  
Bobolink/*Dolichonyx oryzivorus*  
Bohemian waxwing/*Bombicilla garrulus*  
Bonaparte's gull/*Larus philadelphia*

## BIRDS (Continued)

Botteri's sparrow/*Aimophila botterii*  
Brant/*Branta bernicla*  
Brewer's blackbird/*Euphagus cyanocephalus*  
Brewer's sparrow/*Spizella breweri*  
Broad-tailed hummingbird/*Cynanthus latirostris*  
Broad-winged hawk/*Buteo platypterus*  
Bronzed cowbird/*Molothrus aeneus*  
Brown creeper/*Certhia americana*  
Brown noddy/*Anous stolidus*  
Brown pelican/*Pelecanus occidentalis*  
Brown thrasher/*Toxostoma rufum*  
Brown-crested flycatcher/*Myiarchus tyrannulus*  
Brown-headed cowbird/*Molothrus ater*  
Brown-headed nuthatch/*Sitta pusilla*  
Buff-bellied hummingbird/*Amazilia yucatanensis*  
Buff-breasted sandpiper/*Tryngites subruficollis*  
Bufflehead/*Bucephala albeola*  
Burrowing owl/*Athene cunicularia*  
Cactus wren/*Campylorhynchus brunneicapillus*  
California gull/*Larus californicus*  
Canada goose/*Branta canadensis*  
Canada warbler/*Wilsonia canadensis*  
Canvasback/*Aythya valisineria*  
Canyon wren/*Catherpes mexicanus*  
Cape May warbler/*Dendroica tigrina*  
Carolina chickadee/*Parus carolinensis*  
Carolina wren/*Thryotharus ludovicianus*  
Caspian tern/*Sterna caspia*  
Cassin's kingbird/*Tyrannus vociferans*  
Cassin's sparrow/*Aimophila cassinii*  
Cattle egret/*Bubulcus ibis*  
Cave swallow/*Hirundo fulva*  
Cedar waxwing/*Bombycilla cedrorum*  
Cerulean warbler/*Dendroica cerulea*  
Chestnut-collared longspur/*Calcarius ornatus*  
Chestnut-sided warbler/*Dendroica pensylvanica*  
Chihuahuan raven/*Corvus cryptoleucus*  
Chimney swift/*Chaetura pelagica*  
Chipping sparrow/*Spizella passerina*  
Chuck-will's-widow/*Caprimulgus carolinensis*  
Chukar/*Alectoris chukar*  
Cinnamon teal/*Anas cyanoptera*  
Clapper rail/*Rallus longirostris*  
Clark's nutcracker/*Nucifraga columbiana*  
Clay-colored robin/*Turdus grayi*  
Clay-colored sparrow/*Spizella pallida*  
Cliff swallow/*Hirundo pyrrhonota*  
Common barn owl/*Tyto alba*  
Common black hawk/*Buteogallus anthracinus*

## BIRDS (Continued)

Common goldeneye/*Bucephala clangula*  
Common grackle/*Quiscalus quiscula*  
Common ground-dove/*Columbina passerina*  
Common loon/*Gavia immer*  
Common merganser/*Mergus merganser*  
Common moorhen/*Gallinula chloropus*  
Common nighthawk/*Chordeiles minor*  
Common poorwill/*Phalaenoptilus nuttallii*  
Common raven/*Corvus corax*  
Common snipe/*Gallinago gallinago*  
Common tern/*Sterna hirundo*  
Common yellowthroat/*Geothlypis trichas*  
Connecticut warbler/*Oporornis agilis*  
Cooper's hawk/*Accipiter cooperii*  
Couch's kingbird/*Tyrannus couchii*  
Crested caracara/*Polyborus plancus*  
Crimson-colored grosbeak/*Rhodothraupis celaeno*  
Curlew sandpiper/*Calidais ferruginea*  
Curved-billed thrasher/*Toxostoma curvirostre*  
Dark-eyed junco/*Junco hyemalis*  
Dickcissel/*Spiza americana*  
Double-crested cormorant/*Phalacrocorax auritus*  
Downy woodpecker/*Picoides pubescens*  
Dunlin/*Calidris alpina*  
Eared grebe/*Podiceps nigricollis*  
Eastern bluebird/*Sialia sialis*  
Eastern kingbird/*Tyrannus tyrannus*  
Eastern meadowlark/*Sturnella magna*  
Eastern phoebe/*Sayornis phoebe*  
Eastern screech-owl/*Otus asio*  
Eastern wood-pewee/*Contopus virens*  
Elegant trogon/*Trogon elegans*  
Elf owl/*Micrathene whitneyi*  
Eskimo curlew/*Numenius borealis*  
Eurasian wigeon/*Anas penelope*  
European starling/*Sturnus vulgaris*  
Evening grosbeak/*Coccothraustes vespertinus*  
Ferruginous hawk/*Buteo regalis*  
Ferruginous pygmy-owl/*Glaucidium brasilianum*  
Field sparrow/*Spizella pusilla*  
Fish crow/*Corvus ossifragus*  
Fork-tailed flycatcher/*Tyrannus savana*  
Forster's tern/*Sterna forsteri*  
Fox sparrow/*Passerella iliaca*  
Franklin's gull/*Larus pipixcan*  
Fulvous whistling-duck/*Dendrocygna bicolor*  
Gadwall/*Anas strepera*  
Glaucous gull/*Larus hyerboreus*

## BIRDS (Continued)

Glossy ibis/*Plegadis falcinellus*  
Golden eagle/*Aquila chrysaetos*  
Golden winged warbler/*Vermivora chrysoptera*  
Golden-crowned kinglet/*Regulus satrapa*  
Golden-crowned sparrow/*Zonotrichia atricapilla*  
Golden-crowned warbler/*Basileuterus culicivorus*  
Golden-fronted woodpecker/*Melanerpes aurifrons*  
Grasshopper sparrow/*Ammodramus savannarum*  
Gray catbird/*Dumetella carolinensis*  
Gray hawk/*Buteo nitidus*  
Gray kingbird/*Tyrannus dominicensis*  
Gray silky flycatcher/*Ptilogonys cinereus*  
Gray-cheeked thrush/*Catharus minimus*  
Gray-crowned yellowthroat /*Geothlypis poliocephala*  
Great black-backed gull/*Larus marinus*  
Great blue heron/*Ardea herodias*  
Great egret/*Casmerodius albus*  
Great horned owl/*Bubo virginianus*  
Great kiskadee/*Pitangus sulphuratus*  
Great-crested flycatcher/*Myiarchus crinitus*  
Great-tailed grackle/*Quiscalus mexicanus*  
Greater flamingo/*Phoenicopterus ruber*  
Greater pewee/*Contopus pertinax*  
Greater prairie chicken/*Tympanuchus cupido*  
Greater roadrunner/*Geococcyx californianus*  
Greater scaup/*Aythya marila*  
Greater white-fronted goose/*Anser albifrons*  
Greater yellowlegs/*Tringa melanoleuca*  
Green jay/*Cyanocorax yncas*  
Green kingfisher/*Ceryle americana*  
Green parakeet/*Aratinga holochlora*  
Green violet-ear/*Coliri thalassinus*  
Green-backed heron/*Butorides straitus*  
Green-tailed towhee/*Pipilo chlorurus*  
Green-winged teal/*Anas crecca*  
Groove-billed ani/*Crotophaga sulcirostris*  
Gull-billed tern/*Sterna nilotica*  
Hairy woodpecker/*Picoides villosus*  
Harris' hawk/*Parabuteo unicinctus*  
Harris' sparrow/*Zonotrichia querula*  
Henslow's sparrow/*Ammodramus henslowii*  
Hepatic tanager/*Piranga flava*  
Hermit thrush/*Catharus guttatus*  
Hermit warbler/*Dendroica occidentalis*  
Herring gull/*Larus argentatus*  
Hooded merganser/*Lophodytes cucullatus*  
Hooded oriole/*Ocyrops cucullatus*  
Hooded warbler/*Wilsonia citrina*  
Hooked-billed kite/*Chondrohierax uncinatus*

## BIRDS (Continued)

Horned grebe/*Podiceps auritus*  
Horned lark/*Eremophila alpestris*  
House finch/*Carpodacus mexicanus*  
House sparrow/*Passer domesticus*  
House wren/*Troglodytes aedon*  
Hudsonian godwit/*Limosa haemastica*  
Inca dove/*Columbina inca*  
Indigo bunting/*Passerina cyanea*  
Jabiru/*Jabiru mycteria*  
Kentucky warbler/*Oporornis formosus*  
Killdeer/*Charadrius vociferus*  
King rail/*Rallus elegans*  
Ladder-backed woodpecker/*Picoides scalaris*  
Lapland longspur/*Calcarius lapponicus*  
Lark bunting/*Calamospiza melanocorys*  
Lark sparrow/*Chondestes grammacus*  
Laughing gull/*Larus atricilla*  
Lazuli bunting/*Passerina amoena*  
Least bittern/*Ixobrychus exilis*  
Least flycatcher/*Empidonax minimus*  
Least sandpiper/*Calidris minutilla*  
Least tern/*Sterna antillarum*  
LeConte's sparrow/*Ammodramus leconteii*  
Lesser black-backed gull/*Larus fuscus*  
Lesser goldfinch/*Carduelis psaltria*  
Lesser nighthawk/*Chordeiles acutipennis*  
Lesser scaup/*Aythya affinis*  
Lesser yellowlegs/*Tringa flaviceps*  
Lincoln's sparrow/*Melospiza lincolni*  
Little blue heron/*Egretta caerulea*  
Loggerhead shrike/*Lanius ludovicianus*  
Long-billed curlew/*Numenius americanus*  
Long-billed dowitcher/*Limnodromus scolopaceus*  
Long-billed thrasher/*Toxostoma longirostre*  
Long-eared owl/*Asio otus*  
Long-tailed jaeger/*Stercorarius longicaudus*  
Louisiana waterthrush/*Seiurus motacilla*  
Lucifer hummingbird/*Calothorax lucifer*  
MacGillivray's warbler/*Oporornis tolmiei*  
Magnificent frigatebird/*Fregata magnificens*  
Magnolia warbler/*Dendroica magnolia*  
Mallard/*Anas platyrhynchos*  
Mangrove cuckoo/*Coccyzus minor*  
Marbled godwit/*Limosa fedoa*  
Marsh wren/*Cistothorus palustris*  
Masked booby/*Sula dactylatra*  
Masked duck/*Oxyura dominica*  
McCown's longspur/*Calcarius mccownii*  
Merlin/*Falco columbarius*

**BIRDS (Continued)**

Mexican crow/*Corvus imparatus*  
Mississippi kite/*Ictinia mississippiensis*  
Monk parakeet/*Myiopsitta monachus*  
Mottled duck/*Anas fulvigula*  
Mountain bluebird/*Sialia currucoides*  
Mountain plover/*Charadrius montanus*  
Mourning dove/*Zenaida macroura*  
Mourning warbler/*Oporornis philadelphia*  
Nashville warbler/*Vermivora ruficapilla*  
Neotropic cormorant/*Phalacrocorax olivaceus*  
Northern beardless tyrannulet/*Camptostoma imberbe*  
Northern bobwhite/*Colinus virginianus*  
Northern cardinal/*Cardinalis cardinalis*  
Northern flicker/*Colaptes auratus*  
Northern gannet/*Sula bassanus*  
Northern goshawk/*Accipiter gentilis*  
Northern harrier/*Circus cyaneus*  
Northern jacana/*Jacana spinosa*  
Northern mockingbird/*Mimus polyglottos*  
Northern oriole/*Icterus galbula*  
Northern parula/*Parula americana*  
Northern pintail/*Anas acuta*  
Northern rough-winged swallow/*Stelgidopteryx serripennis*  
Northern shoveler/*Anas clypeata*  
Northern shrike/*Lanius excubitor*  
Northern waterthrush/*Seiurus noveboracensis*  
Oldsquaw/*Clangula hyemalis*  
Olive sparrow/*Arremonops rufivirgatus*  
Olive-sided flycatcher/*Contopus borealis*  
Orange-crowned warbler/*Vermivora celata*  
Orchard oriole/*Icterus spurius*  
Osprey/*Pandion haliaetus*  
Ovenbird/*Seiurus aurocapillus*  
Pacific loon/*Gavia pacifica*  
Painted bunting/*Passerina ciris*  
Painted redstart/*Myioborus pictus*  
Palm warbler/*Dendroica palmarum*  
Parasitic jaeger/*Stercorarius parasiticus*  
Pauraque/*Nyctidromus albigollis*  
Pectoral sandpiper/*Calidris melanotos*  
Peregrine falcon/*Falco peregrinus*  
Phainopepla/*Phainopepla nitens*  
Philadelphia vireo/*Vireo philadelphicus*  
Pied-billed grebe/*Podilymbus podiceps*  
Pileated woodpecker/*Dryocopus pileatus*  
Pine siskin/*Carduelis pinus*  
Pine warbler/*Dendroica pinus*

**BIRDS (Continued)**

Piping plover/*Charadrius melodus*  
Plain chachalaca/*Ortalis vetula*  
Pomarine jaeger/*Stercorarius pomarinus*  
Prairie falcon/*Falco mexicanus*  
Prairie warbler/*Dendroica discolor*  
Prothonotary warbler/*Protonotaria citrea*  
Purple finch/*Carpodacus purpureus*  
Purple gallinule/*Porphyryla martinica*  
Purple martin/*Progne subis*  
Purple sandpiper/*Calidris maritima*  
Pyrrhuloxia/*Cardinalis sinuatus*  
Red crossbill/*Loxia curvirostra*  
Red knot/*Calidris canutus*  
Red phalarope/*Phalaropus fulicaria*  
Red-bellied woodpecker/*Melanerpes carolinus*  
Red-bellied pigeon/*Columba flaviviridis*  
Red-breasted merganser/*Mergus serrator*  
Red-breasted nuthatch/*Sitta canadensis*  
Red-cockaded woodpecker/*Picoides borealis*  
Red-crowned parrot/*Amazona viridigenalis*  
Red-eyed vireo/*Vireo olivaceus*  
Red-faced warbler/*Cardellina rubrifrons*  
Red-headed woodpecker/*Melanerpes erythrocephalus*  
Red-necked grebe/*Podiceps grisegena*  
Red-necked phalarope/*Phalaropus lobatus*  
Red-shouldered hawk/*Buteo lineatus*  
Red-tailed hawk/*Buteo jamaicensis*  
Red-throated loon/*Gavia stellata*  
Red-winged blackbird/*Agelaius phoeniceus*  
Reddish egret/*Egretta rufescens*  
Redhead/*Aythya americana*  
Ring-billed gull/*Larus delawarensis*  
Ring-necked duck/*Aythya collaris*  
Ring-necked pheasant/*Phasianus colchicus*  
Ringed kingfisher/*Ceryle torquata*  
Roadside hawk/*Buteo magnirostris*  
Rock dove/*Columba livia*  
Rock wren/*Salpinctes obsoletus*  
Rose-breasted grosbeak/*Pheucticus ludovicianus*  
Roseate spoonbill/*Ajaia ajaia*  
Roseate tern/*Sterna dougallii*  
Ross' goose/*Chen rossii*  
Rough-legged hawk/*Buteo lagopus*  
Royal tern/*Sterna maxima*  
Ruby-crowned kinglet/*Regulus calendula*  
Ruby-throated hummingbird/*Archilochus colubris*  
Ruddy duck/*Oxyura jamaicensis*  
Ruddy ground dove/*Columbina talpacoti*

**BIRDS (Continued)**

Ruddy turnstone/*Arenaria interpres*  
Ruff/*Philomachus pugnax*  
Rufous hummingbird/*Selasphorus rufus*  
Rufous-capped warbler/*Basileuterus rufifrons*  
Rufous-sided towhee/*Pipilo erythrophthalmus*  
Rufous-tailed hummingbird/*Amazilia tzacatl*  
Rusty blackbird/*Euphagus carolinus*  
Sage thrasher/*Oreoscoptes montanus*  
Sanderling/*Calidris alba*  
Sandhill crane/*Grus canadensis*  
Sandwich tern/*Sterna sandvicensis*  
Savannah sparrow/*Passerculus sandwichensis*  
Say's phoebe/*Sayornis saya*  
Scaled quail/*Callipepla squamata*  
Scarlet tanager/*Piranga olivacea*  
Scissor-tailed flycatcher/*Tyrannus forficatus*  
Seaside sparrow/*Ammodramus maritimus*  
Sedge wren/*Cistothorus platensis*  
Semipalmated plover/*Charadrius semipalmatus*  
Semipalmated sandpiper/*Calidris pusilla*  
Sharp-shinned hawk/*Accipiter striatus*  
Sharp-tailed sparrow/*Ammodramus caudatus*  
Short-billed dowitcher/*Limnodromus griseus*  
Short-eared owl/*Asio flammeus*  
Snail kite/*Rostrhamus sociabilis*  
Snow goose/*Chen caerulescens*  
Snowy egret/*Egretta thula*  
Snowy plover/*Charadrius alexandrinus*  
Solitary sandpiper/*Tringa solitaria*  
Solitary vireo/*Vireo solitarius*  
Song sparrow/*Melospiza melodia*  
Sooty tern/*Sterna fuscata*  
Sora/*Porzana carolina*  
Spotted sandpiper/*Actitis macularia*  
Sprague's pipit/*Anthus spragueii*  
Stellar's jay/*Cyanocitta stelleri*  
Stilt sandpiper/*Calidris himantopus*  
Summer tanager/*Piranga rubra*  
Surf scoter/*Melanitta perspicillata*  
Surfbird/*Aphriza virgata*  
Swainson's hawk/*Buteo swainsoni*  
Swainson's thrush/*Catharus ustulatus*  
Swainson's warbler/*Limnithlypis swainsonii*  
Swamp sparrow/*Melospiza georgiana*  
Tennessee warbler/*Vermivora peregrina*  
Thayer's gull/*Larus thayeri*  
Townsend's solitaire/*Myadestes townsendi*  
Townsend's warbler/*Dendroica townsendi*  
Tree swallow/*Tachycineta bicolor*

**BIRDS (Continued)**

Tricolored heron/*Egretta caerulea*  
Tropical kingbird/*Tyrannus melancholicus*  
Tropical parula/*Parula pitiayumi*  
Tufted titmouse/*Parus bicolor*  
Tundra swan/*Cygnus columbianus*  
Turkey vulture/*Cathartes aura*  
Upland sandpiper/*Bartramia longicauda*  
Varied bunting/*Passerina versicolor*  
Varied thrush/*Ixoreus naevius*  
Veery/*Catharus fuscescens*  
Verdin/*Auriparus flaviceps*  
Vermillion flycatcher/*Pyrocephalus rubinus*  
Vesper sparrow/*Pooecetes gramineus*  
Violet-green swallow/*Tachycineta thalassina*  
Virginia rail/*Rallus limicola*  
Virginia warbler/*Vermivora virginiae*  
Wandering tattler/*Heteroscelus incanus*  
Warbling vireo/*Vireo gilvus*  
Western bluebird/*Sialia mexicana*  
Western grebe/*Aechmophorus occidentalis*  
Western kingbird/*Tyrannus verticalis*  
Western meadowlark/*Sturnella neglecta*  
Western sandpiper/*Calidris mauri*  
Western tanager/*Piranga ludoviciana*  
Western wood-pewee/*Contopus sordidulus*  
Whimbrel/*Numenius phaeopus*  
Whip-poor-will/*Caprimulgus vociferus*  
White ibis/*Eudocimus albus*  
White-breasted nuthatch/*Sitta carolinensis*  
White-cheeked pintail/*Anas bahamensis*  
White-collared seedeater/*Sporophila torqueola*  
White-collared swift/*Streptoprocne zonaris*  
White-crowned sparrow/*Zonotrichia leucophrys*  
White-eyed vireo/*Vireo griseus*  
White-faced ibis/*Plegadis chihi*  
White-rumped sandpiper/*Calidris fuscicollis*  
White-tailed hawk/*Buteo albicaudatus*  
White-throated sparrow/*Zonotrichia albicollis*  
White-tipped dove/*Leptotila verreauxi*  
White-winged dove/*Zenaidra asiatica*  
White-winged scoter/*Melanitta fusca*  
Whooping crane/*Grus americana*  
Wild turkey/*Meleagris gallopavo*  
Willet/*Catoptrophorus semipalmatus*  
Willow flycatcher/*Empidonax traillii*  
Wilson's phalarope/*Phalaropus tricolor*  
Wilson's plover/*Charadrius wilsonia*  
Wilson's warbler/*Wilsonia pusilla*  
Winter wren/*Troglodytes troglodytes*

### BIRDS (Continued)

Wood duck/*Aix sponsa*  
Wood stork/*Mycteria americana*  
Wood thrush/*Hylocichla mustelina*  
Worm-eating warbler/*Helmitheros vermivorus*  
Yellow rail/*Coturnicops noveboracensis*  
Yellow warbler/*Dendroica petechia*  
Yellow-bellied flycatcher/*Empidonax flaviventris*  
Yellow-bellied sapsucker/*Sphyrapicus varius*  
Yellow-billed cuckoo/*Coccyzus americanus*  
Yellow-breasted chat/*Icteria virens*  
Yellow-crowned night heron/*Nycticorax violaceus*  
Yellow-green vireo/*Vireo flavoviridis*  
Yellow-headed blackbird/*Xanthocephalus xanthocephalus*  
Yellow-headed parrot/*Amazona oratrix*  
Yellow-rumped warbler/*Dendroica coronata*  
Yellow-throated vireo/*Vireo flavifrons*  
Yellow-throated warbler/*Dendroica dominica*  
Yucatan vireo/*Vireo magister*  
Zone-tailed hawk/*Buteo albonotatus*

### MAMMALS

American badger/*Taxidea taxus*  
American beaver/*Castor canadensis*  
Atlantic spotted dolphin/*Stenella frontalis*  
Attwater's pocket gopher/*Geomys attwateri*  
Axis deer/*Cervus axis*  
Baird's pocket gopher/*Geomys breviceps*  
Big brown bat/*Eptesicus fuscus*  
Big free-tailed bat/*Nyctinomops macrotis*  
Black bear/*Ursus americanus*  
Black right whale/*Balaena glacialis*  
Black-tailed jackrabbit/*Lepus californicus*  
Blackbuck antelope/*Antelope cervicapra*  
Blue whale/*Balaenoptera musculus*  
Bobcat/*Lynx rufus*  
Bottle-nosed dolphin/*Tursiops truncatus*  
Brazilian free-tailed bat/*Tadarida brasiliensis*  
Caribbean manatee/*Trichechus manatus*  
Cave myotis/*Myotis velifer*  
Collared peccary (Javelina)/*Tayassu tajacu*  
Common gray fox/*Urocyon cinereoargenteus*  
Common hog-nosed skunk/*Conepatus mesoleucus*  
Common muskrat/*Ondatra zibethicus*  
Common raccoon/*Procyon lotor*  
Cotton mouse/*Peromyscus gossypinus*  
Coues' rice rat/*Oryzomys couesi*  
Cougar (mountain lion)/*Felis concolor*

### MAMMALS (Continued)

Coyote/*Canis latrans*  
Deer mouse/*Peromyscus maniculatus*  
Desert cottontail/*Sylvilagus audubonii*  
Desert shrew/*Notiosorex crawfordi*  
Dwarf sperm whale/*Kogia simus*  
Eastern cottontail/*Sylvilagus floridanus*  
Eastern flying squirrel/*Glaucomys volans*  
Eastern fox squirrel/*Sciurus niger*  
Eastern gray squirrel/*Sciurus carolinensis*  
Eastern harvest mouse/*Reithrodontomys humulis*  
Eastern hog-nosed skunk/*Conepatus leuconotus*  
Eastern mole/*Scalopus aquaticus*  
Eastern pipistrelle/*Pipistrellus subflavus*  
Eastern red bat/*Lasiurus borealis*  
Eastern spotted skunk/*Spilogale putorius*  
Eastern woodrat/*Neotoma floridana*  
Elliot's short-tailed shrew/*Blarina hylophaga*  
Evening bat/*Nycticeius humeralis*  
False killer whale/*Pseudorca crassidens*  
Feral pig (wild hog)/*Sus scrofa*  
Fin whale/*Balaenoptera physalus*  
Fulvous harvest mouse/*Reithrodontomys fulvescens*  
Gervais' beaked whale/*Mesoplodon europaeus*  
Golden mouse/*Ochrotomys nuttalli*  
Goose-beaked whale/*Ziphius cavirostris*  
Gulf Coast hog-nosed skunk *Conepatus leuconotus texensis*  
Gulf Coast kangaroo rat/*Dipodomys compactus*  
Hispid cotton rat/*Sigmodon hispidus*  
Hispid pocket mouse/*Chaetodipus hispidus*  
Hoary bat/*Lasiurus cinereus*  
House mouse/*Mus musculus*  
Jaguarundi/*Felis yagouaroundi*  
Killer whale/*Orcinus orca*  
Least shrew/*Cryptotis parva*  
Long-tailed weasel/*Mustela frenata*  
Marsh rice rat/*Oryzomys palustris*  
Melon-headed whale/*Peponocephala electra*  
Mexican ground squirrel/*Spermophilus mexicanus*  
Mexican spiny pocket mouse/*Liomys irroratus*  
Mink/*Mustela vison*  
Nilgai/*Boselaphus tragocamelus*  
Nine-banded armadillo/*Dasypus novemcinctus*  
Northern grasshopper mouse/*Onychomys leucogaster*  
Northern pygmy mouse/*Baiomys taylori*  
Northern yellow bat/*Lasiurus intermedius*  
Norway rat/*Rattus norvegicus*  
Nutria/*Myocastor coypus*  
Ocelot/*Felis pardalis*  
Ord's kangaroo rat/*Dipodomys ordii*

### MAMMALS (Continued)

Pallid bat/*Antrozous pallidus*  
Panropical spotted dolphin/*Stenella attenuata*  
Plains pocket gopher/*Geomys bursarius*  
Pygmy killer whale/*Feresa attenuata*  
Pygmy sperm whale/*Kogia breviceps*  
Rafinesque's big-eared bat/*Plecotus rafinesquii*  
Red fox/*Vulpes vulpes*  
Red wolf/*Canis rufus*  
Ringtail/*Bassariscus astutus*  
River otter/*Lutra canadensis*  
Roof rat/*Rattus rattus*  
Rough-toothed dolphin/*Steno bredanensis*  
Seminole bat/*Lasiurus seminolus*  
Short-finned pilot whale/*Globicephala macrorhynchus*  
Short-tailed shrew/*Blarina carolinensis*  
Silky pocket mouse/*Perognathus flavus*  
Silver-haired bat/*Lasionycteris noctivagans*  
Southeastern myotis/*Myotis austroriparius*  
Southern plains woodrat/*Neotoma micropus*  
Southern yellow bat/*Lasiurus ega*  
Sperm whale/*Physeter macrocephalus*  
Spotted ground squirrel/*Spermophilus spilosoma*  
Striped skunk/*Mephitis mephitis*  
Swamp rabbit/*Sylvilagus aquaticus*  
Texas pocket gopher/*Geomys personatus*  
Thirteen-lined ground squirrel/*Spermophilus tridecemlineatus*  
Virginia opossum/*Didelphis virginiana*  
White-footed mouse/*Peromyscus leucopus*  
White-nosed coati/*Nasua narica*  
White-tailed deer/*Odocoileus virginianus*  
Yellow-faced pocket gopher/*Cratogeomys castanops*

### AMPHIBIANS

Barred tiger salamander/*Ambystoma tigrinum marvortium*  
Black-spotted newt/*Notophthalmus meridionalis*  
Blanchard's cricket frog/*Acris crepitans blanchardi*  
Bronze frog/*Rana clamitans clamitans*  
Bullfrog/*Rana catesbeiana*  
Central newt/*Notophthalmus viridescens louisianensis*  
Coastal cricket frog/*Acris crepitans paludicola*  
Cope's gray treefrog/*Hyla chrysoscelis*  
Couch's spadefoot/*Scaphiopus couchi*  
Dwarf salamander/*Eurycea quadridigitata*  
East Texas toad/*Bufo woodhousei velatus*

### AMPHIBIANS (Continued)

Eastern green toad/*Bufo debilis*  
Eastern narrowmouth toad/*Gastrophryne carolinensis*  
Eastern tiger salamander/*Ambystoma tigrinum tigrinum*  
Giant toad/*Bufo marinus*  
Gray treefrog/*Hyla versicolor*  
Great Plains narrowmouth toad/*Gastrophryne olivacea*  
Green treefrog/*Hyla cinerea*  
Gulf Coast toad/*Bufo valliceps*  
Gulf Coast waterdog/*Necturus beyeri*  
Houston toad/*Bufo houstonensis*  
Hurter's spadefoot/*Scaphiopus holbrooki hurteri*  
Marbled salamander/*Ambystoma opacum*  
Mexican treefrog/*Smilisca baudinii*  
Northern cricket frog/*Acris crepitans crepitans*  
Northern spring peeper/*Hyla crucifer crucifer*  
Pickerel frog/*Rana palustris*  
Pig frog/*Rana grylio*  
Plains spadefoot/*Scaphiopus bombifrons*  
Rio Grande chirping frog/*Syrhophus cystignathoides campi*  
Rio Grande leopard frog/*Rana berlandieri*  
Rio Grande lesser siren/*Siren intermedia texana*  
Sheep frog/*Hypopachus variolosus*  
Smallmouth salamander/*Ambystoma texanum*  
Southern crawfish frog/*Rana areolata areolata*  
Southern dusky salamander/*Desmognathus auriculatus*  
Southern leopard frog/*Rana sphenoccephala*  
Spotted chorus frog/*Pseudacris clarki*  
Squirrel treefrog/*Hyla squirella*  
Strecker's chorus frog/*Pseudacris streckeri*  
Texas toad/*Bufo speciosus*  
Three-toed amphiuma/*Amphiuma tridactylum*  
Upland chorus frog/*Pseudacris triseriata feriarum*  
Western lesser siren/*Siren intermedia nettingi*  
White-lipped frog/*Leptodactylus fragilis*  
Woodhouse's toad/*Bufo woodhousei woodhousei*

### REPTILES

Alligator snapping turtle/*Macrolemys temmincki*  
American alligator/*Alligator mississippiensis*  
Atlantic green sea turtle/*Chelonia mydas*  
Atlantic hawksbill sea turtle/*Eretmochelys imbricata*  
Bent-toed gecko/*Cyrtodactylus scaber*

**REPTILES (Continued)**

Black-striped snake/*Coniophanes imperialis imperialis*  
 Blotched water snake/*Nerodia erythrogaster transversa*  
 Broad-banded copperhead/*Agkistrodon contortrix laticinctus*  
 Broad-banded water snake/*Nerodia fasciata onfluens*  
 Broadhead skink/*Eumeces laticeps*  
 Brown anole/*Anolis sagrei*  
 Bullsnake/*Pituophis melanoleucus sayi*  
 Buttermilk racer/*Coluber constrictor anthicus*  
 Cagle's map turtle/*Graptemys caglei*  
 Central American speckled racer/*Drymobius margaritiferus*  
 Checkered garter snake/*Thamnophis marcianus*  
 Common musk turtle/*Sternotherus odoratus*  
 Common snapping turtle/*Chelydra serpentina*  
 Corn snake/*Elaphe guttata guttata*  
 Desert kingsnake/*Lampropeltis getulus splendida*  
 Desert massasauga/*Sistrurus catenatus edwardsii*  
 Diamondback water snake/*Nerodia rhombifera*  
 Dusty hognose snake/*Heterodon nasicus gloydi*  
 Eastern coachwhip/*Masticophis flagellum flagellum*  
 Eastern garter snake/*Thamnophis sirtalis sirtalis*  
 Eastern hognose snake/*Heterodon platyrhinos*  
 Eastern rough green snake/*Opheodrys aestivus aestivus*  
 Eastern tree lizard /*Urosaurus ornatus ornatus*  
 Eastern yellowbellied racer/*Coluber constrictor flaviventris*  
 Five-lined skink/*Eumeces fasciatus*  
 Flathead snake/*Tantilla gracilis*  
 Florida water snake/*Nerodia fasciata pictiventris*  
 Four-lined skink/*Eumeces tetragrammus*  
 Graham's crayfish snake/*Regina grahamii*  
 Great Plains rat snake/*Elaphe guttata emoryi*  
 Great Plains skink/*Eumeces obsoletus*  
 Green anole/*Anolis carolinensis*  
 Green water snake/*Nerodia cyclopion*  
 Ground skink/*Scincella lateralis*  
 Guadalupe spiny softshell/*Trionyx spiniferus guadalupensis*  
 Gulf Coast ribbon snake/*Thamnophis proximus orarius*  
 Gulf crayfish snake/*Regina rigida sinicola*  
 Gulf salt marsh snake/*Nerodia fasciata clarkii*  
 Keeled earless lizard/*Holbrookia propinqua*  
 Kemp's Ridley sea turtle/*Lepidochelys kemp*  
 Leatherback sea turtle/*Dermochelys coriacea*

**REPTILES (Continued)**

Loggerhead sea turtle/*Caretta caretta*  
 Louisiana milk snake/*Lampropeltis triangulum amaura*  
 Marsh brown snake/*Storeria dekayi limnetes*  
 Mediterranean gecko/*Hemidactylus turicus*  
 Mesquite lizard/*Sceloporus grammicus microlepidotus*  
 Metter's river cooter/*Pseudemys concinna metteri*  
 Mexican hognose snake/*Heterodon nasicus kennerlyi*  
 Mexican hooknose snake/*Ficimia streckeri*  
 Mexican milk snake/*Lampropeltis triangulum annulata*  
 Mexican racer/*Coluber constrictor oaxaca*  
 Midland smooth softshell/*Trionyx muticus muticus*  
 Mississippi map turtle/*Graptemys kohnii*  
 Mississippi mud turtle/*Kinosternon subrubrum hippocrepis*  
 Mississippi ringneck snake/*Diadophis punctatus tictogenys*  
 Northern cat-eyed snake/*Leptodeira septentrionalis*  
 Northern fence lizard/*Sceloporus undulatus yacanthinus*  
 Northern scarlet snake/*Cemophora coccinea copei*  
 Ornate box turtle/*Terrapene ornata*  
 Pallid spiny softshell/*Trionyx spiniferus pallidus*  
 Plains blind snake/*Leptotyphlops dulcis dulcis*  
 Prairie kingsnake/*Lampropeltis calligaster calligaster*  
 Prairie ringneck snake/*Diadophis punctatus arnyi*  
 Razorback musk turtle/*Sternotherus carinatus*  
 Red-eared slider/*Trachemys scripta elegans*  
 Rosebelly lizard/*Sceloporus variabilis marmoratus*  
 Rough earth snake/*Virginia striatula*  
 Ruthven's whipsnake/*Masticophis taeniatus ruthveni*  
 Schott's whipsnake/*Masticophis taeniatus schotti*  
 Six-lined racerunner/*Cnemidophorus sexlineatus*  
 Southern copperhead/*Agkistrodon contortrix contortrix*  
 Southern earless lizard/*Holbrookia lacerata subcaudalis*  
 Southern prairie lizard/*Sceloporus undulatus consobrinus*  
 Southern prairie skink/*Eumeces septentrionalis obtusirostris*  
 Southern redbelly snake/*Storeria occipitomaculata obscura*  
 Speckled kingsnake/*Lampropeltis getulus holbrooki*  
 Taylor's ground snake/*Sonora semiannulata taylori*

## REPTILES (Continued)

Texas banded gecko/*Coleonyx brevis*  
 Texas blackhead snake/*Tantilla nigriceps fumiceps*  
 Texas brown snake/*Storeria dekayi texana*  
 Texas coral snake/*Micrurus fulvius tenere*  
 Texas diamondback terrapin/*Malaclemys terrapin littoralis*  
 Texas earless lizard/*Cophosaurus texanus texanus*  
 Texas glossy snake/*Arizona elegans arenicola*  
 Texas horned lizard/*Phrynosoma cornutum*  
 Texas indigo snake/*Drymarchon corais erebennus*  
 Texas lined snake/*Tropidoclonion lineatum texanum*  
 Texas longnose snake/*Rhinocheilus lecontei tessellatus*  
 Texas night snake/*Hypsiglena torquata jani*  
 Texas patchnose snake/*Salvadora grahamiae lineata*  
 Texas rat snake/*Elaphe obsoleta lindheimeri*  
 Texas river cooter/*Pseudemys concinna texana*  
 Texas scarlet snake/*Cemophora coccinea lineri*  
 Texas spiny lizard/*Sceloporus olivaceus*  
 Texas spiny softshell/*Trionyx spiniferus emoryi*  
 Texas spotted whiptail/*Cnemidophorus gularis gularis*  
 Texas tortoise/*Gopherus berlandieri*  
 Three-toed box turtle/*Terrapene carolina triunguis*  
 Timber (canebrake) rattlesnake/*Crotalus horridus atricaudatus*  
 Western chicken turtle/*Deirochelys reticularia miaria*  
 Western coachwhip/*Masticophis flagellum testaceus*  
 Western cottonmouth/*Agkistrodon piscivorus leucostoma*  
 Western diamondback rattlesnake/*Crotalus atrox*  
 Western massasauga/*Sistrurus catenatus tergeminus*  
 Western mud snake/*Farancia abacira reinwardti*  
 Western pigmy rattlesnake/*Sistrurus miliarius streckeri*  
 Western rough green snake/*Opheodrys aestivus majalis*  
 Western slender glass lizard/*Ophisaurus attenuatus*  
 Western smooth green snake/*Opheodrys vernalis blanchardi*  
 Western spiny-tailed iguana /*Ctenosaura pectinata*  
 Yellow mud turtle/*Kinosternon flavescens*  
 Yellowbelly water snake/*Nerodia erythrogaster flavigaster*  
 Zug's river cooter/*Pseudemys concinna gorzugi*

## FISH

Alligator gar/*Lepisosteus spatula*  
 Amazon molly/*Poecilia formosa*  
 American eel/*Anguilla rostrata*  
 Atlantic bumper/*Chloroscombrus shrysurus*  
 Atlantic croaker/*Micropogonias undulatus*  
 Atlantic cutlassfish/*Trichiurus lepturus*  
 Atlantic needlefish/*Strongylura marina*  
 Atlantic stingrays/*Dasyatis sabina*  
 Atlantic threadfin/*Polydactylus octonemus*  
 Banded pygmy sunfish/*Elassoma zonatum*  
 Bantam sunfish/*Lepomis symmetricus*  
 Barred grunt/*Conodon nobilis*  
 Bay anchovy/*Anchoa mitchilli*  
 Bay whiff/*Citharichthys spilopterus*  
 Bayou killifish/*Fundulus pulvereus*  
 Bayou topminnow/*Fundulus notti*  
 Bigmouth buffalo/*Ictiobus cyprinellus*  
 Bigmouth sleeper/*Gobiomorus dormitor*  
 Bigscale logperch/*Percina macrolepidia*  
 Black buffalo/*Ictiobus niger*  
 Black bullhead/*Ameiurus melas*  
 Black crappie/*Pomoxis nigromaculatus*  
 Black drum/*Pogonias cromis*  
 Blackcheek tonguefish/*Symphurus plagiosa*  
 Blackspot shiner/*Notropis atrocaudalis*  
 Blackspotted topminnow/*Fundulus olivaceus*  
 Blackstripe topminnow/*Fundulus notatus*  
 Blacktail redhorse/*Moxostoma poecilurum*  
 Blacktail shiner/*Cyprinella venusta*  
 Blue catfish/*Ictalurus furcatus*  
 Blue runner/*Caranx crysos*  
 Blue sucker/*Cycleptus elongatus*  
 Blue tilapia/*Tilapia aurea*  
 Bluefish/*Pomatomus saltatrix*  
 Bluegill/*Lepomis macrochirus*  
 Bluntnose darter/*Etheostoma chlorosomum*  
 Bluntnose jack/*Hemicaranx amblyrhynchus*  
 Bowfin/*Amia calva*  
 Brook silversides/*Labidesthes sicculus*  
 Bull shark/*Prionace glauca*  
 Bullhead minnow/*Pimephales vigilax*  
 Burro grunt/*Pomadourus croco*  
 Central stoneroller/*Campostoma oligolepis*  
 Chain pickerel/*Esox niger*  
 Chain pipefish/*Syngnathus pelagicus*  
 Channel catfish/*Ictalurus punctatus*  
 Chestnut lamprey/*Ichthyomyzon castaneus*  
 Chub shiner/*Notropis potteri*  
 Clear Creek gambusia/*Gambusia heterochir*

### FISH (Continued)

Clown goby/*Microgobius gulosus*  
Cobia/*Rachycentron canadum*  
Code goby/*Gobiosoma robustum*  
Common carp/*Cyprinus carpio*  
Common snook/*Centropomus undecimalis*  
Creek chub/*Semotilus atromaculatus*  
Creek chubsucker/*Erimyzon oblongus*  
Crevalle jack/*Caranx hippos*  
Cypress darter/*Etheostoma proeliare*  
Cypress minnow/*Hybognathus hayi*  
Darter goby/*Goionellus boleosoma*  
Diamond killifish/*Adinia xenica*  
Dollar sunfish/*Lepomis marginatus*  
Dusky darter/*Percina sciera*  
Emerald shiner/*Notropis atherinoides*  
Emerald sleeper/*Eretelis smaragdus*  
Fat sleeper/*Dormitator maculatus*  
Fat snook/*Centropomus parallelus*  
Fathead minnow/*Pimephales promelas*  
Finescale menhaden/*Brevoortia gunteri*  
Finetooth shark/*Carcharhinus isodon*  
Flagfin mojarra/*Eucinostomus melanopterus*  
Flathead catfish/*Pylocictis olivaris*  
Flier/*Centrarchus macropterus*  
Florida pompano/*Trachinotus carolinus*  
Fountain darter/*Etheostoma fonticola*  
Freckled madtom/*Noturus nocturnus*  
Freshwater drum/*Aplodinotus grunniens*  
Freshwater goby/*Gobionellus shufeldti*  
Frillfin goby/*Bathygobius soporator*  
Fringed flounder/*Etropus crossotus*  
Gafftopsail catfish/*Bagre marinus*  
Ghost shiner/*Notropis buechanani*  
Gizzard shad/*Dorosoma cepedianum*  
Golden shiner/*Notemigonus crysoleucas*  
Golden topminnow/*Fundulus chrysotus*  
Goldfish/*Carassius auratus*  
Goldstripe darter/*Etheostoma parvipinne*  
Grass carp/*Ctenopharyngodon idella*  
Gray redhorse/*Moxostoma congestum*  
Gray snapper/*Lutjanus griseus*  
Green sunfish/*Lepomis cyanellus*  
Greenthroat darter/*Etheostoma lepidum*  
Guadalupe bass/*Micropterus treculi*  
Gulf flounder/*Paralichthys albigutta*  
Gulf killifish/*Fundulus grandis*  
Gulf menhaden/*Brevoortia patronus*  
Gulf pipefish/*Syngnathus scovelli*  
Guppy/*Poecilia reticulata*

### FISH (Continued)

Hardhead catfish/*Arius felis*  
Harlequin darter/*Etheostoma histrio*  
Highfin goby/*Gobionellus oceanicus*  
Hogchoker/*Trinectes maculatus*  
Inland Silversides/*Menidia beryllina*  
Inshore lizardfish/*Synodus foetens*  
Irish pompano/*Diapterus auratus*  
Ironcolor shiner/*Notropis chalybaeus*  
Keeltail needlefish/*Platybelone argalus*  
Ladyfish/*Elops saurus*  
Lake chubsucker/*Erimyzon sucetta*  
Lane snapper/*Lutjanus synagris*  
Largemouth bass/*Micropterus salmoides*  
Largespring gambusia/*Gambusia geiseri*  
Least puffer/*Sphoeroides parvus*  
Leatherjack/*Oligoplites saurus*  
Lined sole/*Achhirus lineatus*  
Longear sunfish/*Lepomis megalotis*  
Longnose gar/*Lepisosteus osseus*  
Longnose killifish/*Fundulus similis*  
Lyre goby/*Evorthodus lyricus*  
Mexican tetra/*Astyanax mexicanus*  
Mimic shiner/*Notropis volucellus*  
Mississippi silvery minnow/*Hybognathus nuchalis*  
Mountain mullet/*Agonostomus monticola*  
Mozambique tilapia/*Tilapia mossambica*  
Mud darter/*Etheostoma asprigene*  
Mutton snapper/*Lutjanus analis*  
Naked goby/*Gobiosoma bosc*  
Opossum pipefish/*Microphis brachyurus*  
Orangespotted sunfish/*Lepomis humilis*  
Orangethroat darter/*Etheostoma spectabile*  
Pallid shiner/*Notropis amnis*  
Permit/*Trachinotus falcatus*  
Pig fish/*Orthopristis chrysoptera*  
Pinfish/*Lagodon rhomboides*  
Pirate perch/*Aphredoderus sayanus*  
Plains killifish/*Fundulus zebrinus*  
Plains minnow/*Hybognathus placitus*  
Pugnose minnow/*Oregonichthys emiliae*  
Rainbow trout/*Oncorhynchus mykiss*  
Rainwater killifish/*Lucania parva*  
Red drum/*Sciaenops ocellatus*  
Red lizardfish/*Synodus synodus*  
Red River pupfish/*Cyprinodon rubrofluviatilis*  
Red shiner/*Cyprinella lutrensis*  
Red snapper/*Lutjanus campechanus*  
Redbelly tilapia/*Tilapia zilli*

### FISH (Continued)

Redbreast sunfish/*Lepomis auritus*  
Redear sunfish/*Lepomis microlophus*  
Redfin darter/*Etheostoma whipplei*  
Redfin pickerel/*Esox americanus*  
Redfin shiner/*Lythrurus umbratilis*  
Ribbon shiner/*Lythrurus fumeus*  
Rio Grande cichlid/*Cichlasoma cyanoguttatum*  
River carpsucker/*Carpionodes carpio*  
River darter/*Percina shumardi*  
Rock bass/*Ambloplites rupestris*  
Rough silversides/*Membras martinica*  
Round herring/*Etrumeus teres*  
Roundnose shiner/*Dionda episcopa*  
Sabine shiner/*Notropis sabinae*  
Sailfin molly/*Poecilia latipinna*  
Saltmarsh topminnow/*Fundulus jenkinsi*  
San Marcos gambusia/*Gambusia georgei*  
Sand seatrout/*Cynoscion arenarius*  
Sand shiner/*Notropis stramineus*  
Sargassumfish/*Histrio histrio*  
Scaled herring/*Harengula jaguana*  
Scaly sand darter/*Ammocrypta vivax*  
Sharpnose shiner/*Notropis oxyrhynchus*  
Sheepshead/*Archosargus probatocephalus*  
Sheepshead minnow/*Cyprinodon variegatus*  
Silver chub/*Macrhybopsis storeriana*  
Silver jenny/*Eucinostomus gula*  
Silver perch/*Bairdiella chrysoura*  
Silverband shiner/*Notropis shumardi*  
Silverside spp./*Menidia* spp.  
Skipjack herring/*Alsoa chrysochloris*  
Slough darter/*Etheostoma gracile*  
Smalleye shiner/*Notropis buccula*  
Smallmouth bass/*Micropterus dolomieu*  
Smallmouth buffalo/*Ictiobus bubalus*  
Southern brook lamprey/*Ichthyomyzon gagei*  
Southern flounder/*Paralichthys lethostigma*  
Southern hake/*Urophycis floridana*  
Southern stargazer/*Astroscopus y-graecum*  
Spanish mackerel/*Scomberomorus maculatus*  
Speckled chub/*Macrhybopsis aestivalis*  
Speckled wormeel/*Myrophis punctatus*  
Spinycheek sleeper/*Eleotris pisonis*  
Spot/*Leiostomus xanthurus*  
Spotfin flounder/*Cyclopsetta fimbriata*  
Spotfin mojarra/*Eucinostomus argenteus*  
Spotted bass/*Micropterus punctulatus*  
Spotted gar/*Lepisosteus oculatus*  
Spotted seatrout/*Cynoscion nebulosus*

### FISH (Continued)

Spotted sucker/*Minytrema melanops*  
Spotted sunfish/*Lepomis punctatus*  
Striped anchovy/*Anchoa hepsetus*  
Striped bass/*Morone saxatilis*  
Striped mullet/*Mugil cephalus*  
Suckermouth catfish/*Hypostomus plecostomus*  
Suckermouth minnow/*Phenacoobius mirabilis*  
Swamp darter/*Etheostoma fusiforme*  
Tadpole madtom/*Noturus gyrinus*  
Taillight shiner/*Notropis maculatus*  
Tarpon/*Megalops atlanticus*  
Texas logperch/*Percina carbonaria*  
Texas shiner/*Notropis amabilis*  
Threadfin shad/*Dorosoma petenense*  
Tidewater silverside/*Menidia peninsulae*  
Violet goby/*Gobioides broussoneti*  
Walleye/*Stizostedion vitreum*  
Warmouth/*Lepomis gulosus*  
Warsaw grouper/*Pinephelus nigritus*  
Weed shiner/*Notropis texanus*  
Western mosquitofish/*Gambusia affinis*  
Western sand darter/*Ammocrypta clara*  
White bass/*Morone chrysops*  
White crappie/*Pomoxis annularis*  
White mullet/*Mugil curema*  
Yellow bass/*Morone mississippiensis*  
Yellow bullhead/*Ameiurus natalis*

### INVERTEBRATES

Blue crab/*Callinectes sapidus*  
Brown shrimp/*Penaeus aztecus*  
Ghost crab/*Ocypode quadrata*  
Grass shrimp/*Palaemonetes* spp.  
Pink shrimp/*Penaeus dorsalis*  
Tiger beetle/*Cicindela* spp.  
White shrimp/*Penaeus setiferus*

Appendix H - Wildlife in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province

Appendix H-2 - List of Common Mammals Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province

Appendix H-3List of Common Amphibians Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province

Appendix H-4List of Common Reptiles Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Or.	Jef.	Cha.	Har.	Upper Coast Counties					Whar.	Mat.	Jac.	1	2	3	Habitats		
					Ft.B.	Gal.	Braz.	4	5							6	7	
LOONS																		
Common loon		X	X	X		X	X		X		X							
GREBES																		
Pied-billed grebe		X	X	X		X	X	X	X		X					X		
Eared grebe			X	X		X	X				X							
PELICANS																		
American white pelican	X	X	X	X		X	X		X		X							
CORMORANTS																		
Double-crested cormorant	X	X	X	X		X	X	X	X	X	X					X		
Neotropic cormorant		X	X	X		X	X		X		X					X		
DARTERS																		
Anhinga	X	X	X	X	X	X	X	X	X	X	X					X		
BITTERNS AND HERONS																		
Great blue heron	X	X	X	X	X	X	X	X	X	X	X							
Great egret	X	X	X	X	X	X	X	X	X	X	X					X		
Snowy egret	X	X	X	X	X	X	X	X	X	X	X					X		
Redish egret		X	X	X		X	X		X		X					X		
Tricolored heron	X	X	X	X	X	X	X	X	X	X	X					X		
Little blue heron	X	X	X	X	X	X	X	X	X	X	X					X		
Green-backed heron	X	X	X	X	X	X	X		X	X	X					X	X	
Cattle egret	X	X	X	X	X	X	X	X	X	X	X				X	X		
Black-crowned night heron	X	X	X	X	X	X		X		X	X					X	X	

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>IBISES AND SPOONBILLS</b>																	
Roseate spoonbill		X	X	X	X	X	X		X	X	X				X	X	
<b>SWANS, GEESE, AND DUCKS</b>																	
Canada goose	X	X	X	X	X	X	X	X	X	X	X				X	X	
Greater white-fronted goose		X	X	X		X	X	X	X	X	X				X	X	
Snow goose	X	X	X	X		X	X	X	X	X	X				X	X	
Mottled duck	X	X	X	X	X	X	X	X	X		X						
Gadwall		X	X	X		X	X		X	X	X				X		
American wigeon	X	X	X	X		X	X	X	X	X	X				X		
Northern pintail	X	X	X	X	X	X	X	X	X	X	X				X		
Green-winged teal	X	X	X	X	X	X	X	X	X	X	X				X		
Blue-winged teal	X	X	X	X		X	X		X	X	X				X		
Northern shoveler		X	X	X	X	X	X	X	X	X	X				X		
Redhead		X	X	X		X	X		X		X				X		
Lesser scaup	X	X	X	X		X	X	X	X		X				X		
Ruddy duck		X	X	X		X	X		X		X						
Red-breasted merganser		X	X	X		X	X		X		X						
<b>AMERICAN VULTURES</b>																	
Black vulture	X	X		X	X	X	X	X	X	X		X	X	X			
<b>KITES, HAWKS, AND EAGLES</b>																	
Red-tailed hawk	X	X	X	X	X	X	X	X	X	X		X	X	X			
Red-shouldered hawk	X	X	X	X		X	X	X	X	X		X	X				
Northern harrier	X	X	X	X	X	X	X	X	X	X				X	X	X	

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>CARACARAS AND FALCONS</b>																	
American kestrel	X	X	X	X	X	X	X	X	X	X		X		X			
<b>PARTRIDGES, TURKEYS, AND QUAIL</b>																	
Northern bobwhite	X	X	X	X	X	X	X	X	X	X		X		X			
<b>RAILS, GALLINULES, AND COOTS</b>																	
Clapper rail	X	X	X	X		X	X	X	X							X	
Common moorhen		X	X	X		X	X		X		X					X	
American coot		X	X	X		X	X	X	X		X					X	
<b>PLOVERS</b>																	
Piping plover		X	X		X	X		X			X						
Semipalmated plover			X	X	X	X		X			X						
Wilson's plover		X	X	X		X	X		X		X						
Killdeer	X	X	X	X	X	X	X	X	X	X	X				X	X	
American golden-plover		X	X	X		X	X	X			X			X			
Black-bellied plover	X	X	X	X	X	X	X		X		X						
<b>STILTS AND AVOCETS</b>																	
Black-necked stilt	X	X	X	X	X	X	X		X	X	X				X		
American avocet		X	X	X		X	X		X		X				X		

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>SANDPIPERS AND PHALAROPES</b>																	
Ruddy turnstone		X	X	X	X	X	X		X	X	X						
Common snipe	X	X	X	X	X	X	X	X	X	X	X				X	X	
Long-billed curlew	X	X	X	X		X	X	X	X	X	X				X	X	
Willet		X	X	X		X	X		X	X	X				X		
Greater yellowlegs	X	X	X	X	X	X	X	X	X	X	X				X		
Lesser yellowlegs	X	X	X	X	X	X	X	X	X	X	X				X		
Pectoral sandpiper		X	X	X	X	X	X		X		X					X	
Least sandpiper		X	X	X		X	X	X	X		X					X	
Dunlin		X	X	X		X	X		X		X					X	
Long-billed dowitcher	X	X	X	X		X	X		X		X				X	X	
Short-billed dowitcher	X	X	X	X		X	X		X		X				X	X	
Semipalmated sandpiper	X	X	X			X	X		X		X					X	
Western sandpiper		X	X	X		X	X		X		X					X	
Sanderling		X	X	X		X	X		X		X						
Whimbrel		X	X	X	X	X	X		X		X			X	X		
<b>GULLS, TERNS, AND SKIMMERS</b>																	
Herring gull	X	X	X	X		X	X	X	X		X				X	X	
Ring-billed gull	X	X	X	X		X	X	X	X		X				X	X	
Laughing gull	X	X	X	X		X	X		X	X	X				X	X	
Forster's tern	X	X	X	X		X	X	X	X		X				X		
Least tern		X	X	X		X	X		X		X						
Royal tern		X	X	X		X	X		X		X				X		
Sandwich tern		X	X	X		X	X		X		X				X		
Caspian tern		X	X	X		X	X		X		X				X		
Black tern		X	X	X	X	X	X		X	X	X				X	X	
Black skimmer		X	X	X		X	X		X	X	X				X		

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>PIGEONS AND DOVES</b>																	
Rock dove	X	X	X	X	X	X	X	X	X	X		X	X	X		X	
Mourning dove	X	X	X	X	X	X	X	X	X	X		X	X	X		X	
<b>TYPICAL OWLS</b>																	
Barred owl	X	X	X	X	X	X	X	X	X	X			X		X		X
<b>GOATSUCKERS</b>																	
Common nighthawk	X	X	X	X	X	X	X	X	X	X		X					
<b>SWIFTS</b>																	
Chimney swift	X	X	X	X	X	X	X	X	X	X		X		X			
<b>HUMMINGBIRDS</b>																	
Ruby-throated hummingbird	X	X	X	X	X	X	X	X	X				X	X			
<b>KINGFISHERS</b>																	
Belted kingfisher	X	X	X	X	X	X	X	X	X			X				X	X
<b>WOODPECKERS</b>																	
Northern flicker	X	X	X	X	X	X	X	X	X				X	X			X
Red-bellied woodpecker	X	X	X	X	X	X	X	X	X					X			X
Yellow-bellied woodpecker	X		X	X	X	X	X	X	X				X				X

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>TYRANT FLYCATCHERS</b>																	
Eastern kingbird	X	X	X	X	X	X	X	X	X		X	X		X			
Scissor-tailed flycatcher		X	X	X	X	X	X	X	X			X		X			
Great-crested flycatcher	X	X	X	X	X	X	X	X	X			X	X				X
Eastern phoebe	X	X	X	X	X	X	X	X	X		X	X	X				X
Eastern wood-pewee		X	X	X	X	X	X	X				X	X				X
<b>LARKS</b>																	
Horned lark		X	X	X	X	X	X	X						X		X	
<b>SWALLOWS</b>																	
Tree swallow	X	X	X	X	X	X	X	X	X	X		X	X	X			X
Bank swallow	X	X	X	X	X	X	X	X	X			X	X	X			
Northern rough-winged swallow	X	X	X	X	X	X	X	X	X			X	X	X			X
Barn swallow		X	X	X	X	X	X	X	X			X		X			
Purple martin	X	X	X	X	X	X	X	X	X			X	X				
<b>JAYS, MAGPIES, AND CROWS</b>																	
Bluejay	X	X	X	X	X	X	X	X	X								X
American crow	X	X	X	X	X	X	X	X	X			X		X			
<b>TITMICE</b>																	
Carolina chickadee	X	X	X	X	X	X	X	X	X	X		X	X				X
Tufted titmouse	X	X	X	X	X	X	X	X	X			X	X				X

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>WRENS</b>																	
Carolina wren	X	X	X	X	X	X	X	X	X	X		X	X				X
Marsh wren	X	X	X	X		X	X		X						X		
Sedge wren		X	X	X		X	X		X	X		X		X	X		
<b>KINGLETS, GNATCATCHERS, AND THRUSHES</b>																	
American robin	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X
Wood thrush		X	X	X		X	X		X	X			X				X
Hermit thrush	X	X	X	X		X	X	X	X	X		X	X				X
Swainson's thrush		X	X	X		X	X		X			X	X				X
Blue-gray gnatcatcher	X	X	X	X	X	X	X	X	X	X		X	X				X
Ruby-crowned kinglet	X	X	X	X	X	X	X	X	X	X		X	X	X			X
<b>MOCKINGBIRDS AND THRASHERS</b>																	
Northern mockingbird	X	X	X	X	X	X	X	X	X	X		X				X	X
Gray catbird		X	X	X	X	X	X	X	X			X				X	X
Brown thrasher	X	X	X	X	X	X	X	X	X	X		X	X				X
<b>PIPITS</b>																	
American pipit	X	X	X	X	X	X	X	X	X		X			X		X	
<b>WAXWINGS</b>																	
Cedar waxwing	X	X	X	X	X	X	X		X	X		X	X				X
<b>SHRIKES</b>																	
Loggerhead shrike	X	X	X	X	X	X	X	X	X	X		X		X			

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>STARLINGS</b>																	
European starling	X	X	X	X	X	X	X	X	X			X	X			X	
<b>VIREOS</b>																	
White-eyed vireo	X	X	X	X	X	X	X	X	X	X		X	X				X
Yellow-throated vireo		X	X	X	X	X	X		X					X			X
Solitary vireo			X	X	X	X	X		X				X				X
Red-eyed vireo	X	X	X	X	X	X	X	X	X				X				X
<b>WOOD WARBLERS</b>																	
Black-and-white warbler		X	X	X	X	X	X	X	X				X				X
Prothonotary warbler	X	X	X	X	X	X	X		X		X		X				X
Tennessee warbler			X	X	X	X	X	X	X				X				X
Orange-crowned warbler	X	X	X	X	X	X	X	X	X				X				X
Northern parula	X	X	X	X	X	X	X	X	X				X				X
Yellow warbler		X	X	X	X	X	X	X	X								X
Magnolia warbler			X	X	X	X	X	X	X	X			X				X
Black-throated green warbler			X	X	X	X	X						X				X
Blackburnian warbler		X	X	X		X			X	X			X				X
Chestnut-sided warbler		X	X	X		X	X		X				X				X
Yellow-rumped warbler	X	X	X	X	X	X	X	X	X	X		X	X			X	X
Bay-breasted warbler			X	X		X	X		X	X			X				X
Ovenbird		X	X	X		X	X		X			X	X				X
Kentucky warbler	X	X	X	X		X	X	X	X	X			X				X
Common yellowthroat	X	X	X	X		X	X	X	X	X	X				X		
Yellow-breasted chat	X	X	X	X		X	X		X	X		X	X				X

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>WOOD WARBLERS</b>																	
(continued)																	
Hooded warbler	X	X	X	X	X	X	X		X			X	X				X
Wilson's warbler			X	X		X	X		X			X	X				X
Canada warbler		X	X	X	X	X	X		X				X				X
American redstart	X	X	X	X		X	X		X				X				X
<b>TANGERS</b>																	
Summer tanager	X	X	X	X	X	X	X	X	X	X			X				X
<b>CARDINALS, GROSBEAKS, AND BUNTINGS</b>																	
Northern cardinal	X	X	X	X	X	X	X	X	X	X		X	X				X
Rose-breasted grosbeak		X	X	X	X	X	X						X				X
Blue grosbeak		X	X	X	X	X	X	X	X			X					
Indigo bunting	X	X	X	X	X	X	X	X				X					X
Dickcissel	X	X	X	X	X	X	X	X	X	X		X		X			
<b>SPARROWS AND TOWHEES</b>																	
Savannah sparrow	X	X	X	X	X	X	X	X	X					X			
Sharp-tailed sparrow		X	X	X		X	X							X	X		
Seaside sparrow	X	X	X	X		X	X		X						X		
White-throated sparrow	X	X	X	X	X	X	X	X	X			X	X				X
Lincoln's sparrow	X	X	X	X	X	X	X	X	X		X	X			X		
Swamp sparrow		X	X	X		X	X		X	X		X	X		X		

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac. = Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;

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Appendix H-1 - List of Common Birds Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
MEADOWLARKS, BLACKBIRDS, AND ORIOLES																	
Eastern meadowlark	X	X	X	X	X	X	X	X	X	X				X			
Red-winged blackbird	X	X	X	X	X	X	X	X	X	X	X			X	X		
Orchard oriole	X	X	X	X	X	X	X	X	X	X			X				
Northern oriole			X	X		X		X		X		X	X				X
Brewer's blackbird		X	X	X	X	X	X	X	X	X		X		X			
Great-tailed grackle	X	X	X	X	X	X	X	X	X	X				X	X	X	
Common grackle	X	X	X	X	X	X	X	X	X	X		X		X			
Brown-headed cowbird	X	X	X	X	X	X	X	X	X	X		X		X		X	
FINCHES																	
American goldfinch	X	X	X	X	X	X	X	X	X			X	X				X
OLD WORLD SPARROWS																	
House sparrow	X	X	X	X	X	X	X	X	X	X			X	X			

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson 1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands;  
Source: Oberholser 1974; A.O.U. 1983; LaVern and Jones 1989

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Appendix H-2 - List of Common Mammals Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>OPOSSUM</b>																		
Virginia opossum	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
<b>MOLES</b>																		
Eastern mole				X	X			X		X			X			X		
<b>SHREWS</b>																		
Least shrew	X	X	X	X	X	X	X	X	X	X			X			X		X
<b>INSECTIVOROUS BATS</b>																		
Eastern red bat		X	X	X	X	X	X	X		X				X			X	
Evening bat				X	X	X	X					X		X				
Seminole bat	X	X	X	X	X	X	X	X	X					X			X	
<b>FREE-TAILED BATS</b>																		
Brazilian free-tailed bat	X		X	X	X	X	X	X	X	X				X	X	X		
<b>ARMADILLOS</b>																		
Nine-banded armadillo	X	X	X	X	X	X	X	X	X	X			X	X	X	X		
<b>HARES AND RABBITS</b>																		
Eastern cotton-tail	X	X	X	X	X	X	X	X	X	X			X	X	X	X		

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix H-2 - List of Common Mammals Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>SQUIRRELS</b>																		
Eastern gray squirrel	X	X	X	X	X	X	X	X	X	X			X	X				
Eastern fox squirrel	X	X	X	X	X	X	X	X	X	X			X	X			X	
Eastern flying squirrel	X	X	X	X	X	X	X	X								X		
<b>POCKET GOPHERS</b>																		
Bairds' pocket gopher	X	X	X	X	X	X	X									X		
Attwaters' pocket gopher					X		X	X	X	X						X		
Plains pocket gopher		X	X	X	X	X										X		
<b>BEAVERS</b>																		
American beaver	X	X	X	X	X	X	X	X	X	X				X				
<b>RATS AND MICE</b>																		
Fulvous harvest mouse	X	X	X	X	X	X	X	X	X	X		X		X	X	X		
Northern pygmy mouse	X	X	X	X	X	X	X	X	X	X		X				X		
Cotton mouse	X	X	X	X		X							X					
Golden mouse	X	X	X	X									X	X				
Marsh rice rat	X	X	X	X	X	X	X	X	X	X		X						
Hispid cotton rat	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson

1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix H-2 - List of Common Mammals Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>RATS AND MICE</b>																		
(continued)																		
Eastern woodrat	X	X	X	X	X	X	X	X	X	X				X		X		
House mouse	X	X	X	X	X	X	X	X	X	X						X	X	
Roof rat	X	X	X	X	X	X	X	X	X	X				X			X	
Norway rat	X	X	X	X	X	X	X	X	X	X		X				X	X	
<b>NUTRIAS</b>																		
Nutria	X	X	X	X	X	X	X	X	X	X		X		X				
<b>RACCOONS</b>																		
Common raccoon	X	X	X	X	X	X	X	X	X	X		X		X				
<b>WEASELS AND RELATIVES</b>																		
Mink	X	X	X	X	X	X	X	X	X	X		X						
Striped skunk	X	X	X	X	X	X	X	X	X	X			X		X	X	X	
<b>DOGS AND RELATIVES</b>																		
Common gray fox	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	
Coyote	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
<b>CATS</b>																		
Bobcat	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
<b>WHALES AND DOLPHINS</b>																		
Bottle-nosed dolphin		X	X			X	X		X		X							

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson

1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix H-2 - List of Common Mammals Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
DEER																		
White-tailed deer	X	X	X	X	X	X	X	X	X	X				X	X	X	X	

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
 1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands;  
 8=Grasslands

Source: Davis 1974; Ramey 1979; Schmidly 1983, 1991; Jones and Jones 1992; USFWS 1992b

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Appendix H-3 - List of Common Amphibians Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>MOLE SALAMANDERS</b>																	
Smallmouth salamander	X	X	X	X	X	X	X	X	X	X					X	X	X
<b>AMPHIUMS</b>																	
Three-toed amphiuma	X	X		X							X				X		
<b>TOADS</b>																	
Gulf Coast toad	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Woodhouse's toad				X	X	X	X	X	X	X	X				X	X	X
<b>TREEFROGS AND RELATIVES</b>																	
Blanchard's cricket frog				X	X	X	X	X	X	X	X						X
Coastal cricket frog	X	X	X												X		
Green treefrog	X	X	X	X	X	X	X	X	X	X	X						X
Squirrel treefrog	X	X	X	X	X	X	X		X			X					
Spotted chorus frog				X	X	X	X	X	X	X				X	X		
<b>NARROWMOUTH TOADS</b>																	
Great Plains narrowmouth toad			X	X	X	X	X	X	X	X			X	X			

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
1=Aquatic (lakes, ponds, ditches); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands (streams, floodplains)

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Appendix H-3 - List of Common Amphibians Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats						
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7
<b>SPADEFoot TOADS</b>																	
Hurter's spadefoot		X	X							X			X			X	
<b>TRUE FROGS</b>																	
Bull frog	X	X	X	X	X	X	X	X	X	X	X						X
Southern leopard frog	X	X	X	X	X	X	X	X	X	X	X			X			

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
 1=Aquatic (lakes, ponds, ditches); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands (streams, floodplains)

Source: Collins et al. 1982; Dixon 1987; Garrett and Barker 1987

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Appendix H-4 - List of Common Reptiles Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>SNAPPING TURTLES</b>																		
Common snapping turtle	X	X	X	X	X	X	X	X	X	X	X							
<b>WATER AND BOX TURTLES</b>																		
Texas cooter					X		X				X						X	
Three-toed box turtle	X	X	X	X	X	X	X	X	X	X		X	X					
Ornate box turtle	X	X	X	X	X	X	X	X	X	X				X		X		
Red-eared slider	X	X	X	X	X	X	X	X	X	X	X				X			
<b>MUD AND MUSK TURTLES</b>																		
Yellow mud turtle							X	X	X	X	X							
Mississippi mud turtle	X	X	X	X	X	X	X	X	X	X	X				X			
<b>SOFTSHELL TURTLES</b>																		
Pallid spiny softshell	X	X		X	X	X					X							
Guadalupe spiny softshell								X	X		X							
<b>GECKOS</b>																		
Mediterranean gecko		X		X	X	X	X	X		X							X	

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
1=Aquatic (lakes, ponds, open bays, rivers, streams); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops, human dwellings; 7=Riparian woodlands (streams, floodplains); 8=Sand dunes and/or rocky areas

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Appendix H-4 - List of Common Reptiles Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>IGUANID LIZARDS</b>																		
Green anole	X	X	X	X	X	X	X	X	X	X			X				X	
Northern fence lizard	X	X		X				X	X	X						X		
<b>SKINKS</b>																		
Five-lined skink	X	X	X	X	X	X	X	X	X							X		
Ground skink	X	X	X	X	X	X	X	X	X	X			X			X		
<b>WHIPTAILS AND RACE RUNNERS</b>																		
Texas spotted whiptail								X	X	X		X		X				
<b>BLIND SNAKES</b>																		
Plains blind snake				X					X				X	X				
<b>SMALL BURROWING SNAKES</b>																		
Flathead snake			X	X					X	X							X	
Marsh brown snake	X	X	X	X	X	X	X	X	X	X		X	X		X	X		
Rough earth snake	X	X	X	X	X	X	X	X	X	X			X	X				
<b>GARTER AND RIBBON SNAKES</b>																		
Gulf Coast ribbon snake	X	X	X	X	X	X	X	X	X	X			X	X				

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson

1=Aquatic (lakes, ponds, open bays, rivers, streams); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops, human dwellings; 7=Riparian woodlands (streams, floodplains); 8=Sand dunes and/or rocky areas

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Appendix H-4 - List of Common Reptiles Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>GREEN SNAKES</b>																		
Western rough green snake	X	X	X	X	X	X		X	X							X		
<b>LARGE, BROWN-BLOTCHED TERRESTRIAL SNAKES</b>																		
Texas rat snake	X	X	X	X	X	X	X	X	X	X			X	X	X			
Eastern hognose snake	X	X	X	X	X	X	X	X	X	X			X	X			X	
Great Plains rat snake									X			X		X			X	
<b>SPECKLED KINGSNAKES</b>																		
Speckled kingsnake	X	X	X	X	X	X	X	X	X	X			X				X	
Desert kingsnake								X	X	X		X						
<b>WHIPSNAKES, RACERS, AND INDIGO SNAKES</b>																		
Eastern coachwhip	X	X	X													X		
Western coachwhip				X	X	X	X	X	X			X		X				

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
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Appendix H-4 - List of Common Reptiles Occurring in the Upper Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Upper Coast Counties										Habitats							
	Or.	Jef.	Cha.	Har.	Ft.B.	Gal.	Braz.	Whar.	Mat.	Jac.	1	2	3	4	5	6	7	8
<b>AQUATIC SNAKES</b>																		
Diamondback water snake	X	X	X	X	X	X	X	X	X	X	X							
Yellowbelly water snake	X	X	X									X						
<b>MILDLY VENOMOUS REAR-FANGED SNAKES</b>																		
Texas night snake							X						X					
<b>RED-BANNED AND BLACK-BANNED SNAKES</b>																		
Northern scarlet snake	X											X						
<b>CORAL SNAKES</b>																		
Texas coral snake	X	X	X	X	X	X	X	X	X	X		X	X					
<b>MOCCASINS</b>																		
Southern copperhead	X	X	X	X	X	X	X	X	X			X						
Western cottonmouth	X	X	X	X	X	X	X	X	X	X			X	X			X	
<b>RATTLESNAKES</b>																		
Western diamondback rattlesnake				X	X	X	X		X	X		X	X	X				X

Legend: Or.=Orange; Jef.=Jefferson; Cha.=Chambers; Har.=Harris; Ft.B.=Fort Bend; Gal.=Galveston; Braz.=Brazoria; Whar.=Wharton; Mat.=Matagorda; Jac.=Jackson  
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Source: Collins et al. 1982; Tennant 1985; Dixon 1987; Garrett and Barker 1987

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
LOONS																	
Common loon		X	X	X	X	X	X	X	X	X	X						
GREBES																	
Pied-billed grebe		X	X	X	X	X	X	X	X	X	X					X	
Eared grebe		X		X	X	X	X				X						
PELICANS																	
American white pelican	X	X	X	X	X	X	X	X	X	X	X						
CORMORANTS																	
Double-crested cormorant	X	X	X	X	X	X	X	X	X	X	X					X	
Neotropic cormorant	X	X	X	X	X	X	X				X					X	
DARTERS																	
Anhinga	X	X	X	X	X	X	X				X					X	
BITTERNS AND HERONS																	
Great blue heron	X	X	X	X	X	X	X	X	X	X	X					X	
Great egret	X	X	X	X	X	X	X	X	X	X	X					X	
Snowy egret	X	X	X	X	X	X	X	X	X	X	X					X	
Reddish egret	X	X	X	X	X	X	X	X	X	X	X					X	

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>BITTERNS AND HERONS (continued)</b>																	
Tricolored heron	X	X	X	X	X	X	X	X	X	X	X				X		
Little blue heron	X	X	X	X	X	X	X				X				X		
Green-backed heron	X	X	X	X	X	X	X				X				X		X
Cattle egret	X	X	X	X	X	X	X				X			X	X		
Black-crowned night heron	X	X	X	X	X	X	X				X				X		X
<b>IBISES AND SPOONBILLS</b>																	
Roseate spoonbill	X	X	X	X	X	X	X				X				X		X
White Ibis								X	X	X	X				X		
<b>SWANS, GEESE, AND DUCKS</b>																	
Canada goose		X	X	X	X	X	X	X	X	X	X				X		X
Greater white-fronted goose		X	X	X	X	X	X				X				X		X
Snow goose	X	X	X	X	X	X	X	X	X	X	X				X		X
Mottled duck	X	X	X	X	X	X	X	X	X	X	X				X		
Gadwall	X	X	X	X	X	X	X	X	X	X	X				X		
American wigeon	X	X		X	X	X	X	X	X	X	X				X		
Northern pintail		X	X	X	X	X	X	X	X	X	X				X		
Green-winged teal		X	X	X	X	X	X	X	X	X	X				X		
Blue-winged teal	X	X	X	X	X	X	X	X	X	X	X				X		

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
SWANS, GEESE, AND DUCKS																	
(continued)																	
Northern shoveler	X	X	X	X	X	X	X	X	X	X	X				X		
Redhead		X	X	X	X	X	X	X	X	X	X				X		
Lesser scaup		X	X	X	X	X	X				X				X		
Ruddy duck		X		X	X	X	X	X	X	X	X						
Red-breasted merganser		X		X		X	X				X						
Black-bellied whistling duck								X	X	X	X				X	X	X
AMERICAN VULTURES																	
Black vulture	X	X	X	X	X	X	X					X	X	X			
Turkey vulture	X	X	X	X	X	X	X	X	X	X		X	X	X			
KITES, HAWKS, AND EAGLES																	
Red-tailed hawk	X	X		X	X	X	X	X	X	X		X	X	X			
Northern harrier	X	X	X	X	X	X	X	X	X	X				X	X	X	
Black-shouldered kite	X	X	X	X	X	X	X					X		X			
Broad-winged hawk	X	X	X	X	X	X	X		X	X		X	X				
Swainson's hawk	X	X	X	X	X	X	X					X		X			
Zone-tailed hawk	X	X	X	X	X	X	X	X	X	X		X	X	X			

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
CARACARAS AND FALCONS																	
American kestrel	X	X	X	X	X	X	X	X	X	X		X		X			
PARTRIDGES, TURKEYS, AND QUAILS																	
Northern bobwhite	X	X	X	X	X	X	X	X	X	X		X		X			
RAILS, GALLINULES, AND COOTS																	
Common moorhen	X		X	X	X	X	X				X					X	
American coot		X	X	X	X	X	X	X	X	X	X					X	
CRANES																	
Sandhill crane	X	X	X	X	X	X	X	X	X	X	X				X	X	
PLOVERS																	
Piping plover		X	X	X		X	X				X						
Semipalmated plover		X		X	X	X	X				X						
Wilson's plover		X		X	X	X	X	X	X	X	X						
Killdeer	X	X	X	X	X	X	X	X	X	X	X				X	X	
American golden plover	X	X		X	X	X	X				X			X			
Black-bellied plover	X	X	X	X	X	X	X	X	X	X	X						

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
STILITS AND AVOCETS																	
Black-necked stilt	X	X	X	X	X	X	X	X	X	X	X				X		
American avocet		X	X	X	X	X	X	X	X	X	X				X		
SANDPIPERS AND PHALAROPES																	
Common snipe	X	X	X	X	X	X	X	X	X	X	X				X	X	
Long-billed curlew	X	X	X	X	X	X	X	X	X	X	X		X	X	X		
Willet		X		X	X	X	X	X	X	X	X			X			
Greater yellowlegs		X	X	X	X	X	X	X	X	X	X			X			
Lesser yellowlegs	X	X	X	X	X	X	X	X	X	X	X			X			
Pectoral sandpiper		X	X	X	X	X	X				X					X	
Least sandpiper		X		X		X	X	X	X	X	X					X	
Dunlin		X	X	X	X	X	X	X	X	X	X					X	
Long-billed dowitcher		X	X	X	X	X	X	X	X	X	X			X	X		
Short-billed dowitcher		X	X	X	X	X	X				X			X	X		
Semipalmated sandpiper		X		X	X	X	X	X	X	X	X					X	
Western sandpiper			X	X		X	X	X	X	X	X					X	
Sanderling		X	X	X	X	X	X				X						
Whimbrel		X		X	X	X	X				X		X	X			

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
GULLS, TERNS, AND SKIMMERS																	
Herring gull		X	X	X	X	X	X				X				X	X	
Ring-billed gull	X	X		X	X	X	X	X	X	X	X				X	X	
Laughing gull		X		X	X	X	X	X	X	X	X				X	X	
Forster's tern		X		X	X	X	X	X	X	X	X				X		
Least tern	X	X	X	X	X	X	X	X	X	X	X						
Royal tern		X	X	X	X	X	X				X				X		
Sandwich tern		X		X	X	X	X				X				X		
Caspian tern		X	X	X	X	X	X	X	X	X	X				X		
Black tern	X	X	X	X	X	X	X	X	X	X	X				X	X	
Black skimmer		X	X	X	X	X	X	X	X	X	X				X		
Frankill's gull	X	X	X	X		X	X				X				X	X	
Gull-billed tern		X		X	X	X	X	X	X	X	X				X		
PIGEONS AND DOVES																	
Rock dove	X	X	X	X	X	X	X	X	X	X		X	X	X		X	
Mourning dove	X	X	X	X	X	X	X	X	X	X		X	X	X		X	
White-winged dove		X		X	X		X					X		X		X	
Inca dove					X	X	X					X	X				
Common ground-dove								X	X	X		X	X				

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

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(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<hr/>																	
CUCKOOS, ROADRUNNERS, AND ANIS																	
Yellow-billed cuckoo								X	X	X		X	X				X
Greater roadrunner								X	X	X		X		X			
GOATSUCKERS																	
Common nighthawk	X	X	X	X	X	X	X	X	X	X		X					
SWIFTS																	
Chimney swift	X	X	X	X	X	X	X	X		X		X		X			
HUMMINGBIRDS																	
Ruby-throated hummingbird	X	X	X	X	X		X					X	X				
KINGFISHERS																	
Belted kingfisher	X	X	X	X	X	X	X	X	X	X	X				X		X
WOODPECKERS																	
Golden-fronted woodpecker								X	X	X		X	X				
Ladder-backed woodpecker								X	X	X		X	X				X

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
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(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
TYRANT																	
FLYCATCHERS																	
Eastern kingbird	X	X	X	X	X	X	X	X	X	X	X	X		X			
Scissor-tailed flycatcher	X	X	X	X	X	X	X	X	X	X		X		X			
Great-crested flycatcher	X	X	X	X	X		X					X	X				X
Eastern phoebe	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Eastern wood-pewee	X	X		X	X		X	X	X	X		X	X				X
Brown-crested flycatcher								X	X	X		X	X				X
LARKS																	
Horned lark		X		X	X	X	X	X	X	X				X		X	
SWALLOWS																	
Tree swallow		X	X	X	X	X	X		X	X		X	X	X			X
Bank swallow	X	X	X	X	X		X		X	X		X	X	X			X
Northern rough-winged swallow		X	X	X	X	X	X	X	X	X		X	X	X			X
Barn swallow		X	X	X	X	X	X	X	X	X		X	X	X			X
Purple martin	X	X	X	X	X	X	X	X	X	X		X	X				

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
WRENS																	
Carolina wren	X	X	X	X	X	X						X	X				X
Marsh wren		X	X	X	X	X									X		
Sedge wren		X	X	X	X	X	X					X			X	X	
Cactus wren								X	X	X			X				
House wren								X	X	X		X	X				X
KINGLETS, GNATCATCHERS, AND THRUSHES																	
American robin	X	X	X	X	X	X	X					X	X	X		X	X
Wood thrush	X		X	X	X	X							X				X
Hermit thrush	X	X	X	X	X	X						X	X				X
Swainson's thrush		X		X	X	X						X	X				X
Blue-gray gnatcatcher	X	X	X	X	X	X	X	X	X	X		X	X				X
Ruby-crowned kinglet	X	X	X	X	X	X	X	X	X	X		X	X	X			
MOCKINGBIRDS AND THRASHERS																	
Northern mockingbird	X	X	X	X	X	X	X	X	X	X	X					X	
Gray catbird	X	X	X	X	X	X	X		X	X		X	X				X
Curved-billed thrasher								X	X	X		X					

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>PIPITS</b>																	
American pipit	X	X	X	X	X	X	X	X	X	X	X			X		X	
<b>WAXWINGS</b>																	
Cedar waxwings	X	X	X	X	X	X	X					X	X				X
<b>SHRIKES</b>																	
Loggerhead shrike	X	X	X	X	X	X	X					X		X			
<b>STARLINGS</b>																	
European starling	X	X	X	X	X	X			X	X		X	X			X	
<b>VIREOS</b>																	
White-eyed vireo	X	X	X	X	X	X	X					X	X				X
Solitary vireo	X		X	X	X	X							X				X
Red-eyed vireo	X	X	X	X	X	X							X				X
<b>WOOD WARBLERS</b>																	
Yellow-rumped warbler	X	X	X	X	X	X	X	X	X	X		X	X			X	X
Black-and-white warbler		X	X	X	X	X	X	X	X	X			X				X
Orange-crowned warbler	X	X	X	X	X	X		X	X	X			X				X
Yellow warbler	X	X	X	X	X	X		X	X	X							X
Magnolia warbler	X		X	X	X	X							X				X

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>WOOD WARBLERS</b>																	
(continued)																	
Black-throated green warbler	X	X	X	X	X	X	X						X				X
Blackburnian warbler	X		X	X		X	X						X				X
Nashville warbler	X		X	X	X	X	X						X				X
Ovenbird	X		X	X	X	X	X					X	X				X
Common yellow-throat	X	X	X	X	X	X	X	X	X	X	X				X		
Yellow-breasted chat	X	X	X	X	X	X	X					X	X				X
Hooded warbler	X		X	X	X	X						X	X				X
Wilson's warbler	X		X	X	X	X	X		X	X		X	X				X
Canada warbler	X	X	X	X	X	X				X			X				X
American redstart	X	X	X	X	X	X			X	X			X				X
<b>TANGERS</b>																	
Summer tanager	X	X	X	X	X	X							X				X
<b>CARDINALS, GROSBEAKS, AND BUNTINGS</b>																	
Northern cardinal	X	X	X	X	X	X	X	X	X	X		X	X				X
Rose-breasted grosbeak	X			X	X	X							X				X
Blue grosbeak	X	X	X	X	X	X	X	X	X	X		X					

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>CARDINALS, GROSBEAKS, AND BUNTINGS</b>																	
(continued)																	
Indigo bunting	X		X	X	X	X	X		X	X		X					X
Dickcissel	X	X	X	X	X	X	X	X	X	X		X		X			
Painted bunting	X	X	X	X	X	X	X	X	X	X		X					X
<b>SPARROWS AND TOWHEES</b>																	
Savannah sparrow	X	X	X	X	X	X	X	X	X	X				X			
Sharp-tailed sparrow		X	X	X	X	X								X	X		
Seaside sparrow		X	X	X	X	X									X		
White-throated sparrow	X		X	X	X	X	X					X	X				X
Lincoln's sparrow	X	X	X	X	X	X	X	X	X	X	X	X			X		
Swamp sparrow		X		X	X	X	X				X	X			X		
Cassin's sparrow								X	X	X		X		X		X	
Vesper sparrow	X	X	X	X	X	X	X	X	X	X		X		X			
Lark sparrow	X	X	X	X	X	X	X	X	X	X		X		X			
Olive sparrow								X	X	X		X					X

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

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Appendix I-1 - List of Common Birds Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>MEADOWLARKS, BLACKBIRDS, AND ORIOLES</b>																	
Eastern meadow-lark	X	X	X	X	X	X	X	X	X	X				X			
Red-winged blackbird	X	X	X	X	X	X	X	X	X	X	X			X	X		
Orchard oriole	X	X	X	X	X	X		X	X	X		X	X				
Northern oriole	X	X	X	X	X	X	X	X	X	X		X	X				X
Brewer's blackbird	X	X	X	X	X	X	X	X	X	X		X		X			
Great-tailed grackle	X	X	X	X	X	X	X	X	X	X				X	X	X	
Bronzed cowbird								X	X	X		X		X			
Brown-headed cowbird	X	X	X	X	X	X	X	X	X	X		X		X		X	
Boat-tailed grackle		X	X	X							X			X	X		
<b>FINCHES</b>																	
American goldfinch	X	X		X	X	X	X					X	X				X
<b>OLD WORLD SPARROWS</b>																	
House sparrow	X	X	X	X	X	X	X	X	X	X			X	X			

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Aquatic (open bays, open gulf, lakes, ponds, shores, mudflats, etc.); 2=Brushland (area of mixed brush and grasses); 3=Forest, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands

Source: Oberholser 1974; A.O.U. 1983; LaVern and Jones 1989

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Appendix I-2 - List of Common Mammals Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
OPOSSUM																		
Virginia opossum	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
SHREWS																		
Least shrew	X	X	X	X	X	X	X						X			X		X
FREE-TAILED BATS																		
Brazilian free-tailed bat	X	X	X	X	X	X	X						X	X	X			
ARMADILLOS																		
Nine-banded armadillo	X	X	X	X	X	X	X	X	X	X			X	X	X	X		
HARES AND RABBITS																		
Eastern cotton- tail	X	X	X	X	X	X	X	X	X	X			X	X	X	X		
Black-tailed jack rabbit	X	X	X	X	X	X	X						X	X				
Desert cottontail								X	X	X					X	X		
Swamp rabbit	X	X	X	X								X		X				

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands;  
8=Grasslands

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Appendix I-2 - List of Common Mammals Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
SQUIRRELS																		
Eastern fox squirrel	X	X	X	X	X	X	X						X	X			X	
Mexican ground squirrel			X	X	X	X	X	X	X	X					X	X	X	
Spotted ground squirrel					X	X	X	X	X	X						X		
POCKET GOPHERS																		
Attwater's pocket gopher	X	X	X	X	X												X	
Texas pocket gopher					X	X	X										X	
Plains pocket gopher	X	X	X	X	X												X	
POCKET MICE AND KANGAROO RATS																		
Hispid pocket mouse	X	X	X	X	X	X	X						X	X				
Mexican spiny pocket mouse										X							X	X
Gulf Coast kangaroo rat					X	X	X	X	X	X							X	
Ord kangaroo rat						X	X	X	X	X							X	
Silky pocket mouse	X	X	X	X	X	X	X								X	X		

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix I-2 - List of Common Mammals Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
BEAVERS																		
American beaver	X	X	X	X	X	X	X	X	X	X				X				
RATS AND MICE																		
Fulvous harvest mouse	X	X	X	X	X	X	X					X		X	X	X		
Northern pygmy mouse	X	X	X	X	X	X	X	X	X	X		X				X		
White-footed mouse	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	
Northern grass-hopper mouse			X	X	X	X	X								X	X		
Marsh rice rat	X	X	X	X	X	X	X					X						
Hispid cotton rat	X	X	X	X	X	X	X					X	X	X	X	X		
Eastern woodrat	X	X											X			X		
House mouse	X	X	X	X	X	X	X									X	X	
Roof rat	X	X	X	X	X	X	X	X	X	X				X			X	
Norway rat	X	X	X	X	X	X	X	X	X	X		X				X	X	
Southern plains woodrat			X	X	X	X	X							X	X	X		
NUTRIAS																		
Nutria	X	X	X	X	X	X	X					X		X				

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix I-2 - List of Common Mammals Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
RACCOONS																		
Common raccoon	X	X	X	X	X	X	X	X	X	X		X		X				
WEASELS AND RELATIVES																		
Eastern spotted skunk	X	X	X	X	X	X	X	X	X	X			X		X	X	X	
Striped skunk	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	
DOGS AND RELATIVES																		
Common gray fox	X	X	X	X	X	X	X						X	X	X	X	X	
Coyote	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
CATS																		
Bobcat	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
WHALES AND DOLPHINS																		
Bottle-nosed dolphin				X	X	X	X				X							
PIGS																		
Feral pig (wild hog)	X	X	X	X	X	X	X					X	X	X	X	X	X	

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

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Appendix I-2 - List of Common Mammals Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
DEER																		
White-tailed deer	X	X	X	X	X	X	X	X	X	X			X	X	X	X		
Axis deer								X	X	X			X	X		X		
SHEEPS, GOATS, AND RELATIVES																		
Blackbuck antelope								X	X	X			X	X		X		
Nilgai antelope	X	X	X	X	X	X	X						X			X		

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Marine area (salt water); 2=Marshes, ponds, lakes; 3=Pine or oak woodlands; 4=Riparian woodlands; 5=Chaparral; 6=Mesquite and savannah communities; 7=Human dwellings, towns, farmlands; 8=Grasslands

Source: Davis 1974; Ramey 1979; Schmidly 1983, 1991; USFWS 1990a; Jones and Jones 1992

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Appendix I-3- List of Common Amphibians Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>MOLE SALAMANDERS</b>																	
Smallmouth salamander	X		X												X	X	X
<b>TOADS</b>																	
Gulf Coast toad	X	X	X	X	X	X	X	X	X	X					X	X	
Woodhouse's toad	X		X					X	X	X	X				X	X	X
<b>TREEFROGS AND RELATIVES</b>																	
Blanchard's cricket frog	X	X	X	X	X					X	X						X
Green treefrog	X		X		X	X	X	X		X	X						X
Squirrel treefrog	X			X	X	X						X					
Spotted chorus frog	X	X	X	X	X	X	X	X		X				X	X		
<b>NARROWMOUTH TOADS</b>																	
Great Plains narrowmouth toad	X	X	X	X	X	X	X	X	X	X			X	X			
<b>SPADEFoot TOADS</b>																	
Hurter's spadetoad		X	X	X	X	X	X	X	X	X			X			X	

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

1=Aquatic (lakes, ponds, ditches); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands (stream, floodplains)

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Appendix I-3- List of Common Amphibians Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats						
	Central Coast					Lower Coast											
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7
<b>TRUE FROGS</b>																	
Rio Grande leopard frog		X	X	X	X	X	X	X	X	X	X						X
Bull frog	X		X	X	X		X	X	X		X						X
Southern leopard frog	X	X		X	X						X				X		

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Aquatic (lakes, ponds, ditches); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine, woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops; 7=Riparian woodlands (stream, floodplains)

Source: Collins et al. 1982; Dixon 1987; Garrett and Barker 1987

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Appendix H-4 - List of Common Reptiles Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
SNAPPING TURTLES																		
Common snapping turtle	X				X						X							
WATER AND BOX TURTLES																		
Texas cooter	X		X								X						X	
Three-toed box turtle	X	X										X	X					
Ornate box turtle	X	X	X	X	X	X		X	X	X				X		X		
Red-eared slider	X		X	X	X	X	X	X	X	X	X				X		X	
MUD AND MUSK TURTLES																		
Yellow mud turtle	X	X	X	X	X	X	X		X	X	X							
Mississippi mud turtle	X	X	X		X		X				X				X			
SOFTSHELL TURTLES																		
Texas spiny softshell									X	X	X							
Guadalupe spiny softshell	X		X		X	X	X				X							
GECKOS																		
Mediterranean gecko	X		X		X	X	X		X	X						X		

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
1=Aquatic (lakes, ponds, open bays, rivers, streams); 2=Brushland (area of mixed brush and grasses); 3=Forest, pine woodland (includes oak mottes); 4=Grassland (short/tall grass prairie); 5=Marsh swamps (freshwater and/or saltwater); 6=Irrigated crops, human dwellings; 7=Riparian woodlands (streams, floodplains); 8=Sand dunes and/or rocky areas

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Appendix H-4 - List of Common Reptiles Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
IGUANID LIZARDS																		
Green anole		X	X	X	X	X	X		X	X		X				X		
Keeled earless lizard	X		X		X	X	X	X	X	X								X
Southern prairie lizard			X	X	X	X	X	X	X	X								X
Northern fence lizard	X	X														X		
SKINKS																		
Five-lined skink	X	X	X													X		
Four-lined skink					X	X	X	X	X	X		X	X	X			X	
Ground skink	X	X	X	X	X	X	X	X					X			X		
WHIPTAILS AND RACE RUNNERS																		
Texas spotted whiptail	X	X	X	X	X	X	X	X	X	X		X		X				
BLIND SNAKES																		
Plains blind snake	X	X	X	X	X	X	X	X		X			X	X				

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
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Appendix H-4 - List of Common Reptiles Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
SMALL BURROWING SNAKES																		
Flathead snake	X	X	X	X	X	X	X	X									X	
Texas blackhead snake	X			X	X	X	X	X		X		X		X				
Texas brown snake			X	X	X	X	X	X	X	X		X	X		X	X		
Texas lined snake	X	X										X						
Taylor's ground snake					X	X	X			X		X						
Rough earth snake	X	X	X	X	X	X		X					X	X				
GARTER AND RIBBON SNAKES																		
Checkered garter snake	X	X	X	X	X	X	X	X	X	X		X						
Gulf Coast ribbon snake	X	X	X	X	X	X	X	X	X	X			X	X				
PATCHNOSE SNAKES																		
Texas patchnose snake		X	X	X	X	X	X	X	X	X				X		X		
GREEN SNAKES																		
Western rough green snake	X	X	X	X	X	X	X			X								X

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron

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Appendix H-4 - List of Common Reptiles Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
LARGE, BROWN-BLOTCHED TERRESTRIAL SNAKES																		
Texas rat snake	X	X	X	X	X	X	X						X	X	X			
Great Plains rat snake			X	X	X	X	X	X	X	X		X		X			X	
Easter hognose snake	X		X	X	X	X	X	X					X	X			X	
Mexican hognose snake								X		X		X						
Bullsnake	X		X	X	X	X	X	X		X		X		X				
Texas glossy snake								X	X	X		X		X				
SPECKLED KINGSNAKES																		
Speckled kingsnake	X	X	X	X									X				X	
Desert kingsnake	X	X	X	X	X	X	X	X	X	X		X						
WHIPSNAKES, RACERS, AND INDIGIO SNAKES																		
Western coachwhip	X	X	X	X	X	X	X	X	X	X		X		X				
Schott's whipsnake			X		X		X	X				X		X				

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Appendix H-4 - List of Common Reptiles Occurring in the Central and Lower Coast Counties of the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Family/Common Name	Counties										Habitats							
	Central Coast					Lower Coast												
	Vic.	Cal.	Ref.	Ar.	S.P.	Nue.	Kle.	Ken.	Will.	Cam.	1	2	3	4	5	6	7	8
AQUATIC SNAKES																		
Diamondback water snake	X	X	X	X	X	X	X	X	X	X		X						
Florida water snake										X		X						
MILDLY VENOMOUS REAR-FANGED SNAKES																		
Texas night snake		X					X	X	X			X						
RED-BANDED AND BLACK-BANDED SNAKES																		
Texas longnose snake		X	X	X	X	X	X			X		X					X	
CORAL SNAKES																		
Texas coral snake	X	X	X	X	X	X	X	X	X	X		X	X					
MOCCASINS																		
Western cotton-mouth	X	X	X	X	X	X							X	X			X	
RATTLESNAKES																		
Western diamondback rattlesnake	X	X	X	X	X	X	X	X	X	X		X	X	X				X

Legend: Vic.=Victoria; Cal.=Calhoun; Ref.=Refugio; Ar.=Aransas; S.P.=San Patricio; Nue.=Nueces; Kle.=Kleberg; Ken.=Kenedy; Will.=Willacy; Cam.=Cameron  
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Source: Collins et al. 1982; Tennant 1985; Dixon 1987; Garrett and Barker 1987

Appendix J - Fish in the Study Area  
(Texas Gulf Coast)

Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province

Appendix J-2 - Fish Fauna of the Lower Rio Grande in the Gulf Coastal Plains Province

Appendix J-3 - Fish Fauna of Texas Estuaries and Bays in the Gulf Coastal Plains Province

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
LAMPREYS						
Chestnut lamprey	N					
Southern Brook lamprey	N	N				
REQUIEM SHARKS						
Finetooth shark				N		
Bull shark	N	N	N	N	N	N
STINGRAYS						
Atlantic stingray	N	N	N	N	N	N
GARS						
Spotted gar	N	N	N	N	N	N
Longnose gar	N	N	N	N	N	N
Alligator gar	N	N	N	N	N	N
BOWFINS						
Bowfin	N	N	N	N		
TARPONS						
Lady fish	N	N	N	N	N	N
FRESHWATER EELS						
American eel	N	N	N	N	N	N
SNAKE EELS						
Speckled wormeel	N	N		N		N

Legend:N=Native; I=Introduced; NI=Considered native but possibly introduced; E=Endemic;

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>HERRINGS</b>						
Skipjack herring	N	N	N	N		
Gulf menhaden	N	N	N	N	N	N
Gizzard shad	N	N	N	N	N	N
Threadfin shad	N	N	N	N	N	N
<b>ANCHOVIES</b>						
Striped anchovy		N				
Bay anchovy	N	N	N	N	N	N
<b>CARPS AND MINNOWS</b>						
Central stoneroller		N	N	N	N	N
Goldfish	I	I	I	I	I	I
Grass carp	I	I				
Ribbon shiner	N	N	N	N		
Red shiner	N	N	N	N	N	N
Blacktail shiner	N	N	N	N	N	N
Common carp	I	I	I	I	I	I
Roundnose shiner				N	N	N
Cypress minnow	N					
Mississippi silvery minnow	N	N	N			
Plains minnow			N	N		
Redfin shiner	N	N			N	N
Speckled chub	N		N	N	N	N
Silver chub			NI			
Golden shiner	N	N	N	N	N	N
Texas shiner				N	N	N
Pallid shiner	N				N	
Emerald shiner	N					
Blackspot shiner	N	N	N			

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
CARPS AND MINNOWS (continued)						
Smalleye shiner			E	I		
Ghost shiner	N	N	N	N	N	N
Ironcolor shiner	N			N		
Taillight shiner	N					
Sharpnose shiner			E	I		
Chub shiner		NI	N	NI		
Sabine shiner	N	N				
Silverband shiner	I	N	N	N		
Sand shiner		N	N	N	N	N
Weed shiner	N	N	N	N	N	N
Mimic shiner	N	N	N	N	N	N
Pugnose shiner	N	N	N	N	N	N
Suckermouth minnow	N	N		N		
Fathead minnow	I	N	N	N	I	I
Bullhead minnow	N	N	N	N	N	N
Creek chub	N	N		I		
SUCKERS						
River carpsucker	N	N	N	N	N	N
Blue sucker	N	N	N	N	N	N
Creek chubsucker	N	N	N			
Lake chubsucker	N	N	N	N	N	
Smallmouth buffalo	N	N	N	N	N	N
Bigmouth buffalo	N					
Black buffalo	N		NI			
Spotted sucker	N	N	N	NI		
Gray redhorse			N	N	N	N
Blacktail redhorse	N	N				
CHARACINS						
Mexican tetra		I	I	I	I	N

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>BULLHEAD CATFISHES</b>						
Black bullhead	N	N	N	N	NI	NI
Yellow bullhead	N	N	N	N	N	N
Blue catfish	N	N	N	N	N	N
Channel catfish	N	N	N	N	N	N
Tadpole madtom	N	N	N	N	N	N
Freckled madtom	N	N				
Flathead catfish	N	N	N	N	N	N
<b>SEA CATFISHES</b>						
Hardhead catfish	N	N	N	N	N	N
Gafftopsail catfish		N	N		N	
<b>SUCKERMOUTH CATFISHES</b>						
Suckermouth catfish		I				
<b>PIKES</b>						
Redfin pickerel	N	N	N			
Chain pickerel	N					
<b>TROUTS</b>						
Rainbow trout			I		I	
<b>LIZARDFISHES</b>						
Inshore lizardfish		N				
<b>PIRATE PERCHES</b>						
Pirate perch	N	N	N	N	N	
<b>NEEDLEFISHES</b>						
Atlantic needlefish	N	N	N	N	N	N

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>KILLIFISHES</b>						
Diamond killifish	N	N				
Red River pupfish			N	I		
Sheepshead minnow	N	N	N	N	N	N
Golden topminnow	N	N	N	N		
Gulf killifish	N	N	N	N	N	N
Saltmarsh topminnow		N				
Blackstripe topminnow	N	N	N	N	N	
Bayou topminnow	N	N	N			
Blackspotted topminnow	N	N	N			
Bayou killifish	N	N	N	N	N	
Longnose killifish		N			N	N
Plains killifish		N	N	N		
Rainwater killifish	N	N	N	N	N	N
<b>LIVEBEARERS</b>						
Western mosquitofish	N	N	N	N	N	N
Largespring gambusia				I	E	
San Marcos gambusia					E	
Clear Creek gambusia				E		
Amazon molly					I	I
Sailfin molly	N	N	N	N	N	N
Guppy				I	I	
<b>SILVERSIDES</b>						
Brook silversides	N	N				
Rough silversides	N	N	N	N	N	N
Inland silversides	N	N	N	N	N	N

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
PIPEFISHES						
Chain pipefish		N				
Gulf pipefish	N	N	N	N	N	N
TEMPERATE BASSES						
White bass	I	I	I	I	I	I
Yellow bass	N	N				
Striped bass	I	I	I			
SUNFISHES						
Rock bass				I	I	
Flier	N	N	N			
Banded pygmy sunfish	N	N	N			
Redbreast sunfish	I	I	I	I	I	I
Green sunfish	N	N	N	N	N	N
Warmouth	N	N	N	N	N	N
Orangespotted sunfish	N	N	N	N		
Bluegill	N	N	N	N	N	N
Dollar sunfish	N	N	N			
Longear sunfish	N	N	N	N	N	N
Redear sunfish	N	N	N	N	N	N
Spotted sunfish	N	N	N	N	N	N
Bantam sunfish	N	N	N	N		
Smallmouth bass			I	I	I	
Spotted bass	N	N	N	N	NI	
Largemouth bass	N	N	N	N	N	N
Guadalupe bass			N	N	N	I
White crappie	N	N	N	N	N	N
Black crappie	N	N	N	I	I	I

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>PERCHES</b>						
Western sand darter	N					
Scaly sand darter	N	N				
Mud darter	N					
Bluntnose darter	N	N	N	N	N	
Fountain darter					E	
Swamp darter	N					
Slough darter	N	N	N	N	N	N
Harlequin darter	N					
Greenthroat darter				N	N	N
Goldstripe darter	N	N	N			
Cypress darter	N	N		N		
Orangethroat darter		N	N	N	N	
Redfin darter	N					
Texas logperch			N	N	N	
Bigscale logperch	N	N	N	N	N	
Dusky darter	N	N	N	N	N	
River darter	N			N		
Walleye	I		I	I		
<b>JACKS</b>						
Crevalle jack		N				
Atlantic bumper	N					
Leatherjack	N	N		N		
<b>SNAPPERS</b>						
Gray snapper	N					
<b>MOJARRAS</b>						
Spotfin mojarra	N	N	N	N	N	N

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>PORGIES</b>						
Sheepshead	N	N		N		
Pinfish	N	N	N	N	N	N
<b>DRUMS</b>						
Freshwater drum	N	N	N	N	N	N
Silver perch	N	N	N	N	N	N
Sand seatrout	N	N	N	N		
Spotted seatrout	N	N	N	N	N	N
Spot	N	N	N	N	N	N
Atlantic croaker	N	N	N	N	N	N
Black drum		N				N
Red drum	N	N	N	N	N	N
<b>CICHLIDS</b>						
Rio Grande cichlid			I	I	I	I
Blue tilapia		I		I	I	
Mozambique tilapia					I	
Redbelly tilapia					I	
<b>MULLETS</b>						
Mountain mullet	N	N				
Striped mullet	N	N	N	N	N	N
White mullet	N	N	N	N	N	N
<b>THREADFINS</b>						
Atlantic threadfin		N				
<b>STARGAZER</b>						
Southern stargazer	N					

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Appendix J-1 - Fish Fauna of the Coastal Rivers in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Coastal Rivers					
	Sabine/Neches	San Jacinto/Trinity	Brazos	Colorado	Guadalupe/San Antonio	Nueces
<b>SLEEPERS</b>						
Fat sleeper	N	N	N	N	N	N
Spinycheek sleeper		N				N
Bigmouth sleeper						N
<b>GOBIES</b>						
Lyre goby	N	N				
Violet goby		N				
Darter goby	N	N	N	N	N	N
Highfin goby	N	N				
Freshwater goby	N	N	N			
Naked goby	N	N	N			N
Code goby	N	N				N
Clown goby	N	N				N
<b>SNAKE MACKERELS</b>						
Atlantic cutlassfish	N	N				
<b>LEFTEYE FLOUNDERS</b>						
Bay whiff	N	N	N	N	N	N
Southern flounder	N	N	N	N	N	N
<b>SOLES</b>						
Lined sole		N				
Blackcheek tonguefish	N					
Hogchoker	N	N	N	N	N	N
<b>PUFFERS</b>						
Least puffer	N					

Legend: N=Native; I=Introduced; NI=Considered native but possibly introduced; E=Endemic;  
Source: Conner and Suttkus 1986; Hubbs et al. 1991; Robbins et al. 1991

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Appendix J-2 - Fish Fauna of the Lower Rio Grande in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Lower Rio Grande*
TARPONS	
Ladyfish	N
SNAKE EELS	
Speckled wormeel	N
HERRINGS	
Skipjack herring	N
Finescale menhaden	N
Gulf menhaden	N
Gizzard shad	N
Threadfin shad	N
Round herring	N
Scaled herring	N
ANCHOVIES	
Striped anchovy	N
Bay anchovy	N
CARPS AND MINNOWS	
Common carp	I
CHARACINS	
Mexican tetra	N
SEA FISHES	
Hardhead catfish	N
LIZARD FISHES	
Inshore lizardfish	N
Red lizardfish	N
CODS	
Southern hake	N
FROGFISHES	
Sargassumfish	N
NEEDLEFISHES	
Keeltail needlefish	N
Atlantic needlefish	N
KILLIFISHES	
Sheepshead minnow	N
Gulf killifish	N
Longnose killifish	N

Legend: N = Native; I = Introduced

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Appendix J-2 - Fish Fauna of the Lower Rio Grande in the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Taxa	Lower Rio Grande*
<b>LIVEBEARERS</b>	
Western mosquitofish	N
<b>SILVERSIDES</b>	
Inland silverside	N
Tidewater silverside	N
<b>PIPEFISHES</b>	
Opossum pipefish	N
Chain pipefish	N
Gulf pipefish	N
<b>SNOOKS</b>	
Fat snook	N
Common snook	N
<b>SEA BASSES</b>	
Warsaw grouper	N
<b>COBIAS</b>	
Cobia	N
<b>JACKS</b>	
Crevalle jack	N
Atlantic bumper	N
Bluntnose jack	N
Leatherjack	N
Florida pompano	N
Permit	N
<b>SNAPPERS</b>	
Mutton snapper	N
Red snapper	N
Gray snapper	N
Lane snapper	N
<b>MOJARRAS</b>	
Irish pompano	N
Spotfin mojarra	N
Silver jenny	N
Flagfin mojarra	N
<b>GRUNTS</b>	
Barred grunt	N
Pig fish	N
Burro grunt	N

Legend: N = Native; I = Introduced

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Appendix J-2 - Fish Fauna of the Lower Rio Grande in the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Taxa	Lower Rio Grande*
<b>PORGIES</b>	
Pinfish	N
<b>DRUMS</b>	
Silver perch	N
Sand seatrout	N
Spotted seatrout	N
Spot	N
Atlantic croaker	N
Black drum	N
Red drum	N
<b>MULLETS</b>	
Mountain mullet	N
Striped mullet	N
White mullet	N
<b>THREADFINS</b>	
Atlantic threadfin	N
<b>SLEEPERS</b>	
Fat sleeper	N
Emerald sleeper	N
Bigmouth sleeper	N
<b>GOBIES</b>	
Frillfin goby	N
Lyre goby	N
Darter goby	N
Highfin goby	N
Naked goby	N
<b>LEFTEYE FLOUNDERS</b>	
Bay whiff	N
Spotfin flounder	N
Fringed flounder	N
Southern flounder	N
<b>SOLES</b>	
Lined sole	N
Blackcheek tonguefish	N

\* Brownsville downstream to the mouth of the Rio Grande at Boca Chica (Cameron County)

Legend: N = Native; I = Introduced

Source: Edward and Contreras - Balderas 1991; Hubbs et al. 1991; Robbins et al 1991

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Appendix J-3 - Fish Fauna of Texas Estuaries and Bays in the Gulf Coastal Plains Province  
(Texas Gulf Coast)

Taxa	Estuaries/Bays								
	Sabine Lake	Galveston Bay	Brazos River	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Baffin Bay	Laguna Madre
	T M *	T M S	T M *	T M S	* M S	* M S	* M S	* * S	* * S
<b>REQUIEM SHARKS</b>									
Bull shark	x x	x x x	ND	x x x	x x	x x	x x	x	x
<b>TARPONS</b>									
Tarpon	x	x x	ND	x x x	x x	x x	x x	x	x
<b>HERRINGS</b>									
Gulf medhaden	x x	x x x	NDx	x x x	x x	x x	x x	x	x
Gizzard shad	x x	x x x	x x	x x x	x x	x x	x x	x	x
<b>ANCHOVIES</b>									
Bay anchovy	x x	x x x	NDx	x x x	x x	x x	x x	x	x
<b>SEA CATFISHES</b>									
Hardhead catfish	x x	x x x	x x	x x	x x	x x	x x	x	x
<b>KILLIFISHES</b>									
Sheepshead minnow	x x	x x x	x x	x x x	x x	x x	x x	x	x
Gulf killifish	x x	x x x	x x	x x x	x x	x x	x x	x	x
<b>SILVERSIDES</b>									
Silversides spp.	x x	x x x	x x	x x x	x x	x x	x x	x	x
<b>SNOOKS</b>									
Common snook		x		x x x		x x	x x	x	

Legend: T=Tidal fresh zone ; M=Mixing zone; \* =Salinity zone not present; S=Seawater zone; ND=No Data;

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Appendix J-3 - Fish Fauna of Texas Estuaries and Bays in the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Taxa	Estuaries/Bays								
	Sabine Lake	Galveston Bay	Brazos River	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Baffin Bay	Laguna Madre
	T M *	T M S	T M *	T M S	* M S	* M S	* M S	* * S	* * S
<b>BLUEFISHES</b>									
Bluefish	x	x x x	NDx	x x	x	x x	x x		
<b>JACKS</b>									
Blue runner		x							
Crevalle jack	x x	x x x	x	x x	x x	x x	x x	x	x
Florida pompano		x		x		x x	x x	x	x
<b>SNAPPERS</b>									
Gray snapper		x		x	x	x x	x x		
								x	x
<b>PORGIES</b>									
Sheepshead	x x	x x x	ND x	x x x	x x	x x	x x	x	x
Pinfish	x x	x x x	ND x	x x x	x x	x x	x x	x	x
<b>DRUMS</b>									
Silver perch	x x	x x x	ND x	x x x	x x	x x	x x	x	x
Sand seatrout	x	x x x	ND x	x x x	x x	x x	x x	x	x
Spotted seatrout	x x	x x x	ND x	x x x	x x	x x	x x	x	x
Spot	x x	x x x	ND x	x x x	x x	x x	x x	x	x
Atlantic croaker	x x	x x x	ND x	x x x	x x	x x	x x	x	x
Black drum	x x	x x x	x x	x x x	x x	x x	x x	x	x
Red drum	x x	x x x	ND x	x x x	x x	x x	x x	x	x
<b>MULLETS</b>									
Striped mullet	x x	x x x	ND x	x x x	x x	x x	x x	x	x
<b>GOBIES</b>									
Code goby		x	ND	x x	x x	x x	x x	x	x

Legend: T=Tidal fresh zone ; M=Mixing zone; \*=Salinity zone not present; S=Seawater zone; ND=No Data;

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Appendix J-3 - Fish Fauna of Texas Estuaries and Bays in the Gulf Coastal Plains Province (continued)  
(Texas Gulf Coast)

Taxa	Estuaries/Bays								
	Sabine Lake	Galveston Bay	Brazos River	Matagorda Bay	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Baffin Bay	Laguna Madre
	T M *	T M S	T M *	T M S	* M S	* M S	* M S	* * S	* * S
<b>MACKERELS</b>									
Spanish mackerel	x	x x	x	x x	x	x x	x x	x	
<b>LEFTEYE FLOUNDERS</b>									
Gulf flounder		x		x x	x x	x x	x x	x	x
Southern flounder	x x	x x x	ND x	x x x	x x	x x	x x	x	x

Legend: T=Tidal fresh zone ; M=Mixing zone; \* =Salinity zone not present; S =Seawater zone; ND=No Data;  
Source: Monaco et al. 1989; Nelson 1992

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Appendix K - List of State Endangered and Threatened Species by County Potentially Occurring in the Gulf Coastal  
Plains Province  
(Texas Gulf Coast)

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TEXAS PARKS AND WILDLIFE DEPARTMENT  
ENDANGERED RESOURCES BRANCH  
SPECIAL SPECIES LIST  
CAMERON COUNTY

Revised:  
98-04-22

Scientific Name	Common Name	Federal Status	State Status
*** AMPHIBIANS			
HYPOPACHUS VARIOLOSUS	SHEEP FROG		T
LEPTODACTYLUS LABIALIS	WHITE-LIPPED FROG		T
NOTOPHTHALMUS MERIDIONALIS	BLACK-SPOTTED NEWT		T
SIREN SP 1	SOUTH TEXAS SIREN (LARGE FORM)		T
SMILISCA BAUDINII	MEXICAN TREEFROG		T
*** BIRDS			
AIMOPHILA BOTTERII TEXANA	TEXAS BOTTERI'S SPARROW		T
BUTEO ALBICAUDATUS	WHITE-TAILED HAWK		T
BUTEO ALBONOTATUS	ZONE-TAILED HAWK		T
BUTEOGALLUS ANTHRACINUS	COMMON BLACK-HAWK		T
CAMPTOSTOMA IMBERBE	NORTHERN BEARDLESS-TYRANNULET		T
CHARADRIUS ALEXANDRINUS	SNOWY PLOVER		
CHARADRIUS MELODUS	PIPING PLOVER	LT	T
EGRETTA RUFESCENS	REDDISH EGRET		T
FALCO FEMORALIS	NORTHERN APLOMADO FALCON	LE	E
SEPTENTRIONALIS			
FALCO PEREGRINUS	PEREGRINE FALCON	E/SA	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	LE	E
FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON	E/SA	T
GEOHYLIPIS TRICHAS INSUPERATA	BROWNSVILLE COMMON YELLOWTHROAT		
GLAUCIDIUM BRASILIANUM	CACTUS FERRUGINOUS PYGMY-OWL		T
CACTORUM			
ICTERUS CUCULLATUS SENNETTI	SENNETT'S HOODED ORIOLE		
ICTERUS GRADUACAUDA AUDUBONII	AUDUBON'S ORIOLE		
MYCTERIA AMERICANA	WOOD STORK		T
PACHYRAMPHUS AGLAIAE	ROSE-THROATED BECARD		T
PARULA PITIAYUMI	TROPICAL PARULA		T
PELECANUS OCCIDENTALIS	BROWN PELICAN	LE	E
PLEGADIS CHIHI	WHITE-FACED IBIS		T
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	LE	E
STERNA FUSCATA	SOOTY TERN		T
*** BIRDS-RELATED			
COLONIAL WATERBIRD NESTING AREAS			
*** FISHES			
AWAOUS TAJASICA	RIVER GOBY		T
GOBIONELLUS ATRIPINNIS	BLACKFIN GOBY		T
MICROPHIS BRACHYURUS	OPOSSUM PIPEFISH		T
* INSECTS			
UCINDELA CHLOROCEPHALA SMYTHI	SMYTH'S TIGER BEETLE		
*** MAMMALS			
FELIS PARDALIS	OCELOT	LE	E
FELIS YAGUARONDI	JAGUARUNDI	LE	E

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ASIURUS EGA	SOUTHERN YELLOW BAT		T
NASUA NARICA	WHITE-NOSED COATI		T
ORYZOMYS COUESI	COUES' RICE RAT		T
PANTHERA ONCA	JAGUAR	LE	T
TRICHECHUS MANATUS	WEST INDIAN MANATEE	LE	E

\*\*\* MOLLUSKS

POPENAIAS POPEI	TEXAS HORNSHELL
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\*\*\* REPTILES

CARETTA CARETTA	LOGGERHEAD SEA TURTLE	LT	T
CHELONIA MYDAS	GREEN SEA TURTLE	LT	T
CONIOPHANES IMPERIALIS	BLACK-STRIPED SNAKE		T
DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	LE	E
DRYMARCHON CORAIS	INDIGO SNAKE		T
DRYMOBIUS MARGARITIFERUS	SPECKLED RACER		T
ERETMOCHELYS IMBRICATA	ATLANTIC HAWKSBILL SEA TURTLE	LE	E
GOPHERUS BERLANDIERI	TEXAS TORTOISE		T
HOLBROOKIA PROPINQUA	KEELED EARLESS LIZARD		
LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	LE	E
LEPTODEIRA SEPTENTRIONALIS	NORTHERN CAT-EYED SNAKE		T
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD		T

VASCULAR PLANTS

ADELIA VASEYI	VASEY'S ADELIA		
AMBROSIA CHEIRANTHIFOLIA	SOUTH TEXAS AMBROSIA	LE	E
ASTROPHYTUM ASTERIAS	STAR CACTUS	LE	E
AYENIA LIMITARIS	TEXAS AYENIA	LE	E
CORYPHANTHA MACROMERIS VAR RUNYONII	RUNYON'S CORY CACTUS		
ECHEANDIA CHANDLERI	LILA DE LOS LLANOS		
GRINDELIA OOLEPIS	PLAINS GUMWEED		
HETERANTHERA MEXICANA	MEXICAN MUD-PLANTAIN		
JUSTICIA RUNYONII	RUNYON'S WATER-WILLOW		
MANFREDA LONGIFLORA	ST. JOSEPH'S STAFF		
TILLANDSIA BAILEYI	BAILEY'S BALLMOSS		

Codes:

- LE,LT - Federally Listed Endangered/Threatened
- PE,PT - Federally Proposed Endangered/Threatened
- E/SA,T/SA - Federally Endangered/Threatened by Similarity of Appearance
- C1 - Federal Candidate, Category 1; information supports proposing to  
list as endangered/threatened
- DL,PDL - Federally Delisted/Proposed Delisted
- E,T - State Endangered/Threatened

Species appearing on these lists do not all share the same probability of occurrence within a county. Some species are migrants or wintering residents only. Additionally, a few species may be historic or considered extirpated within a county. Species considered extirpated within the state are so flagged on each list. Each county's revised date reflects the last date any changes or revisions were made for that county, to reflect current listing statuses and taxonomy.

TEXAS PARKS AND WILDLIFE DEPARTMENT  
ENDANGERED RESOURCES BRANCH  
SPECIAL SPECIES LIST  
KENEDY COUNTY

Revised:  
98-03-27

Scientific Name	Common Name	Federal Status	State Status
*** AMPHIBIANS			
HYPOPACHUS VARIOLOSUS	SHEEP FROG		T
NOTOPHTHALMUS MERIDIONALIS	BLACK-SPOTTED NEWT		T
SIREN SP 1	SOUTH TEXAS SIREN (LARGE FORM)		T
*** BIRDS			
AIMOPHILA BOTTERII TEXANA	TEXAS BOTTERI'S SPARROW		T
BUTEO ALBICAUDATUS	WHITE-TAILED HAWK		T
CAMPTOSTOMA IMBERBE	NORTHERN BEARDLESS-TYRANNULET		T
CHARADRIUS ALEXANDRINUS	SNOWY PLOVER		
CHARADRIUS MELODUS	PIPING PLOVER	LT	T
EGRETTA RUFESCENS	REDDISH EGRET		T
FALCO FEMORALIS	NORTHERN APLOMADO FALCON	LE	E
FALCO SEPTENTRIONALIS			
FALCO PEREGRINUS	PEREGRINE FALCON	E/SA	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	LE	E
FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON	E/SA	T
GLAUCIDIUM BRASILIANUM	CACTUS FERRUGINOUS PYGMY-OWL		T
GLAUCIDIUM CACTORUM			
ICTERUS CUCULLATUS SENNETTI	SENNETT'S HOODED ORIOLE		
ICTERUS GRADUACAUDA AUDUBONII	AUDUBON'S ORIOLE		
MYCTERIA AMERICANA	WOOD STORK		T
PARULA PITIAYUMI	TROPICAL PARULA		T
PELECANUS OCCIDENTALIS	BROWN PELICAN	LE	E
PLEGADIS CHIHI	WHITE-FACED IBIS		T
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	LE	E
*** BIRDS-RELATED			
COLONIAL WATERBIRD NESTING AREAS			
*** FISHES			
MICROPHIS BRACHYURUS	OPOSSUM PIPEFISH		T
*** INSECTS			
CICINDELA NEVADICA OLMOSA	LOS OLMOS TIGER BEETLE		
*** MAMMALS			
FELIS PARDALIS	OCELOT	LE	E
FELIS YAGUARONDI	JAGUARUNDI	LE	E
ORYZOMYS COUESI	COUES' RICE RAT		T
URSUS AMERICANUS	BLACK BEAR	T/SA	T
*** REPTILES			
CARETTA CARETTA	LOGGERHEAD SEA TURTLE	LT	T
CEMOPHORA COCCINEA	SCARLET SNAKE		T
CHELONIA MYDAS	GREEN SEA TURTLE	LT	T
CONIOPHANES IMPERIALIS	BLACK-STRIPED SNAKE		T

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DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	LE	E
DRYMARCHON CORAIS	INDIGO SNAKE		T
ERETMOCHELYS IMBRICATA	ATLANTIC HAWKSBILL SEA TURTLE	LE	E
GOPHERUS BERLANDIERI	TEXAS TORTOISE		T
HOLBROOKIA LACERATA	SPOT-TAILED EARLESS LIZARD		
HOLBROOKIA PROPINQUA	KEELED EARLESS LIZARD		
LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	LE	E
LEPTODEIRA SEPTENTRIONALIS	NORTHERN CAT-EYED SNAKE		T
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD		T

\*\*\* VASCULAR PLANTS

ALLIUM ELMENDORFII	ELMENDORF'S ONION
PARONYCHIA LUNDELLORUM	LUNDELL'S WHITLOW-WORT
SESUVIUM TRIANTHEMOIDES	ROUGHSEED SEA-PURSLANE
TILLANDSIA BAILEYI	BAILEY'S BALLMOSS

Codes:

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TEXAS PARKS AND WILDLIFE DEPARTMENT  
ENDANGERED RESOURCES BRANCH  
SPECIAL SPECIES LIST  
KLEBERG COUNTY

Revised:  
98-03-27

Scientific Name	Common Name	Federal Status	State Status
*** AMPHIBIANS			
HYPOPACHUS VARIOLOSUS	SHEEP FROG		T
NOTOPHTHALMUS MERIDIONALIS	BLACK-SPOTTED NEWT		T
SIREN SP 1	SOUTH TEXAS SIREN (LARGE FORM)		T
*** BIRDS			
BUTEO ALBICAUDATUS	WHITE-TAILED HAWK		T
BUTEO ALBONOTATUS	ZONE-TAILED HAWK		T
CHARADRIUS ALEXANDRINUS	SNOWY PLOVER		
CHARADRIUS MELODUS	PIPING PLOVER	LT	T
EGRETTA RUFESCENS	REDDISH EGRET		T
FALCO FEMORALIS	NORTHERN APLOMADO FALCON	LE	E
FALCO SEPTENTRIONALIS			
FALCO PEREGRINUS	PEREGRINE FALCON	E/SA	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	LE	E
FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON	E/SA	T
ICTERUS GRADUACAUDA AUDUBONII	AUDUBON'S ORIOLE		
MYCTERIA AMERICANA	WOOD STORK		T
PELECANUS OCCIDENTALIS	BROWN PELICAN	LE	E
GADIS CHIHUI	WHITE-FACED IBIS		T
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	LE	E
STERNA FUSCATA	SOOTY TERN		T
*** BIRDS-RELATED			
COLONIAL WATERBIRD NESTING AREAS			
*** FISHES			
MICROPHIS BRACHYURUS	OPOSSUM PIPEFISH		T
*** INSECTS			
STALLINGSIA MACULOSUS	MACULATED MANFREDA SKIPPER		
*** MAMMALS			
FELIS PARDALIS	OCELOT	LE	E
FELIS YAGUARONDI	JAGUARUNDI	LE	E
LASIURUS EGA	SOUTHERN YELLOW BAT		T
PANTHERA ONCA	JAGUAR	LE	T
*** REPTILES			
CARETTA CARETTA	LOGGERHEAD SEA TURTLE	LT	T
CHELONIA MYDAS	GREEN SEA TURTLE	LT	T
DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	LE	E
MARCHON CORAIS	INDIGO SNAKE		T
DERMOCHELYS IMBRICATA	ATLANTIC HAWKSBILL SEA TURTLE	LE	E
GOPHERUS BERLANDIERI	TEXAS TORTOISE		T
HOLBROOKIA LACERATA	SPOT-TAILED EARLESS LIZARD		
HOLBROOKIA PROPINQUA	KEELED EARLESS LIZARD		

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LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	LE	E
LEPTODEIRA SEPTENTRIONALIS	NORTHERN CAT-EYED SNAKE		T
NERODIA CLARKII	GULF SALTMARSH SNAKE		
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD		T
TANTILLA ATRICEPS	MEXICAN BLACKHEAD SNAKE		
*** VASCULAR PLANTS			
AMBROSIA CHEIRANTHIFOLIA	SOUTH TEXAS AMBROSIA	LE	E
ATRIPLEX KLEBERGORUM	KLEBERG SALTBUSH		
ECHEANDIA CHANDLERI	LILA DE LOS LLANOS		
ECHINOCEREUS REICHENBACHII	BLACK LACE CACTUS	LE	E
VAR ALBERTII			
HOFFMANNSEGGIA TENELLA	SLENDER RUSH-PEA	LE	E
PARONYCHIA LUNDELLORUM	LUNDELL'S WHITLOW-WORT		
PSILACTIS HETEROCARPA	WELDER MACHAERANTHERA		
TILLANDSIA BAILEYI	BAILEY'S BALLMOSS		

Codes:

- LE,LT - Federally Listed Endangered/Threatened
- PE,PT - Federally Proposed Endangered/Threatened
- E/SA,T/SA - Federally Endangered/Threatened by Similarity of Appearance
- C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened
- DL,PDL - Federally Delisted/Proposed Delisted
- E,T - State Endangered/Threatened

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TEXAS PARKS AND WILDLIFE DEPARTMENT  
ENDANGERED RESOURCES BRANCH  
SPECIAL SPECIES LIST  
WILLACY COUNTY

Revised:  
98-03-31

Scientific Name	Common Name	Federal Status	State Status
*** AMPHIBIANS			
HYPOPACHUS VARIOLOSUS	SHEEP FROG		T
NOTOPHTHALMUS MERIDIONALIS	BLACK-SPOTTED NEWT		T
SIREN SP 1	SOUTH TEXAS SIREN (LARGE FORM)		T
*** BIRDS			
AIMOPHILA BOTTERII TEXANA	TEXAS BOTTERI'S SPARROW		T
BUTEO ALBICAUDATUS	WHITE-TAILED HAWK		T
BUTEOGALLUS ANTHRACINUS	COMMON BLACK-HAWK		T
CAMPTOSTOMA IMBERBE	NORTHERN BEARDLESS-TYRANNULET		T
CHARADRIUS ALEXANDRINUS	SNOWY PLOVER		
CHARADRIUS MELODUS	PIPING PLOVER	LT	T
EGRETTA RUFESCENS	REDDISH EGRET		T
FALCO FEMORALIS	NORTHERN APLOMADO FALCON	LE	E
SEPTENTRIONALIS			
FALCO PEREGRINUS	PEREGRINE FALCON	E/SA	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	LE	E
FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON	E/SA	T
CAUCIDIUM BRASILIANUM	CACTUS FERRUGINOUS PYGMY-OWL		T
ACTORUM			
ACTERUS CUCULLATUS SENNETTI	SENNETT'S HOODED ORIOLE		T
MYCTERIA AMERICANA	WOOD STORK		
PELECANUS OCCIDENTALIS	BROWN PELICAN	LE	E
PLEGADIS CHIHI	WHITE-FACED IBIS		T
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	LE	E
STERNA FUSCATA	SOOTY TERN		T
*** BIRDS-RELATED			
COLONIAL WATERBIRD NESTING AREAS			
*** FISHES			
MICROPHIS BRACHYURUS	OPOSSUM PIPEFISH		T
*** INSECTS			
EXIMACRIS SUPERBUM	SUPERB GRASSHOPPER		
*** MAMMALS			
FELIS PARDALIS	OCELOT	LE	E
FELIS YAGUARONDI	JAGUARUNDI	LE	E
ORYZOMYS COUESI	COUES' RICE RAT		T
TRICHECHUS MANATUS	WEST INDIAN MANATEE	LE	E
REPTILES			
CARETTA CARETTA	LOGGERHEAD SEA TURTLE	LT	T
CHELONIA MYDAS	GREEN SEA TURTLE	LT	T
CONIOPHANES IMPERIALIS	BLACK-STRIPED SNAKE		T

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DERMOCHELYS CORIACEA	LEATHERBACK SEA TURTLE	LE	E
DRYMARCHON CORAIS	INDIGO SNAKE		T
ERETMOCHELYS IMBRICATA	ATLANTIC HAWKSBILL SEA TURTLE	LE	E
GOPHERUS BERLANDIERI	TEXAS TORTOISE		T
HOLBROOKIA PROPINQUA	KEELED EARLESS LIZARD		
LEPIDOCHELYS KEMPII	KEMP'S RIDLEY SEA TURTLE	LE	E
LEPTODEIRA SEPTENTRIONALIS	NORTHERN CAT-EYED SNAKE		T
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD		T

\*\*\* VASCULAR PLANTS  
 TILLANDSIA BAILEYI

BAILEY'S BALLMOSS

Codes:

- LE, LT - Federally Listed Endangered/Threatened
- PE, PT - Federally Proposed Endangered/Threatened
- E/SA, T/SA - Federally Endangered/Threatened by Similarity of Appearance
- C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened
- DL, PDL - Federally Delisted/Proposed Delisted
- E, T - State Endangered/Threatened

Species appearing on these lists do not all share the same probability of occurrence within a county. Some species are migrants or wintering residents only. Additionally, a few species may be historic or considered extirpated within a county. Species considered extirpated within the state are so flagged on each list. Each county's revised date reflects the last date any changes or revisions were made for that county, to reflect current listing statuses and taxonomy.